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ABSTRACT

This guide provides assistance to key personnel charged with developing an independent school construction process in New South Wales (Australia). The guide's eight booklets emphasize the importance of master plans; encourage cooperation of school staff, boards, and the surrounding community in building schools; and outline the planning process and techniques for greater creativity in school design and efficiencies in the school construction process. Additionally covered are the building of interprofessional relations between school officials and the building industry, effective resource management, and advice on determining whether a particular facility is vital to a school. Examples of school building and planning excellence are included as is a list of contacts and resources. Appendices provide summary statements of important procedures and documents outlined in the guide. (Contains a comprehensive design check list, a list of construction consultants, financial consultants, contributing consultants, and an index.) (GR)

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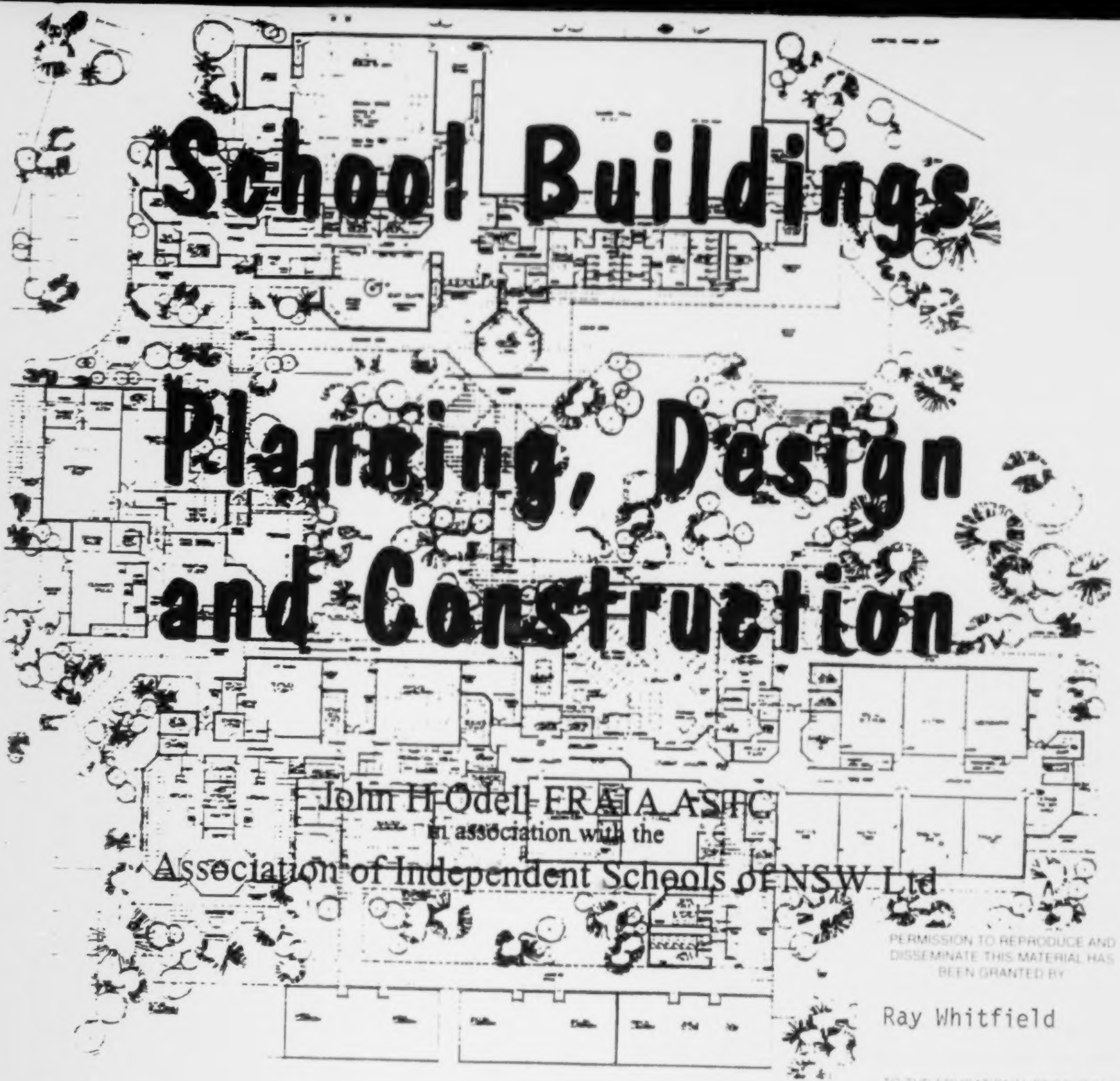

School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

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DEVELOPING A MASTER PLAN FOR YOUR SCHOOL

1

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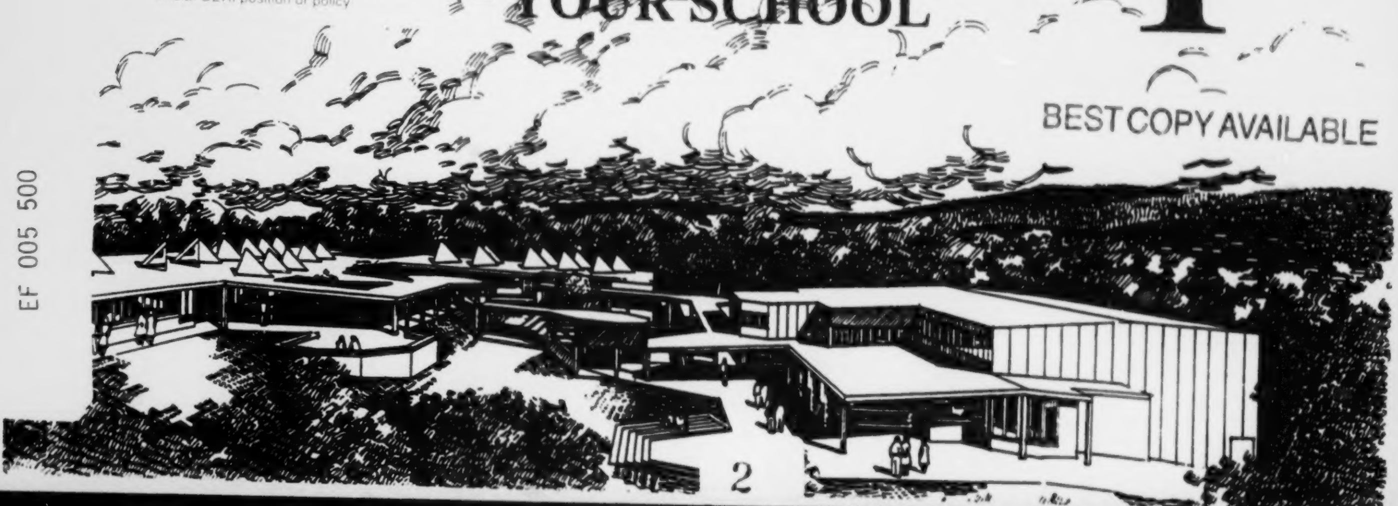

School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1	Introduction and Chapter 1 – Developing a Master Plan
2	Chapter 2 – Making the Most of Your School Site
3	Chapter 3 – Principles of Good School Building Design
4	Chapter 4 – Purpose Designed Facilities
5	Chapter 5 – Construction Methods and Materials
6	Chapter 6 – Managing the Construction Process
7	Chapters 7 and 8 – Technology and Managing Buildings
8	Appendices

ISBN 0 646 23758 6 refers to the complete set of 8 booklets

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Epping NSW, Australia

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John Odell is currently a consultant to the Association of Independent Schools of NSW Ltd through which he is available to schools throughout Australia and elsewhere.

AUTHOR'S ACKNOWLEDGMENTS

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The author also gladly acknowledges assistance received from individual schools and from the Catholic BGAs in NSW and in Queensland and in particular AIS offices in Victoria, Queensland and New South Wales.

Appreciation is expressed to Clarke Hopkins and Clarke, Architects in Victoria for their permission to use the drawing of Warrandyte High School as part of the cover design.

My most profound appreciation goes to my wife Robin and our family for their patient endurance during the many absences from home and from family made necessary by the assembling of data, writing and re-writing of what follows.

John H Odell

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This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

1

Developing a Master Plan for Your School

1. Developing a Master Plan for your School

This chapter will assist those responsible for developing school buildings and grounds to set up a Master Planning Team and to establish a plan for completing the process in the fastest possible time.

This chapter will cover the following aspects of the planning process:

Definition of Master Planning (1.1)

- An overview of the planning process (1.2)
- The skills required in the Planning Team (1.3)
- Assigning the tasks (1.4)
- Allowing Adequate Time (1.5)
- Setting Key Targets (1.6)
- Value Management (1.7)
- Life-cycle costing (1.8)

1880
SCHOOL

WHAT DO WE DO NOW?

1.1. Definition of master planning

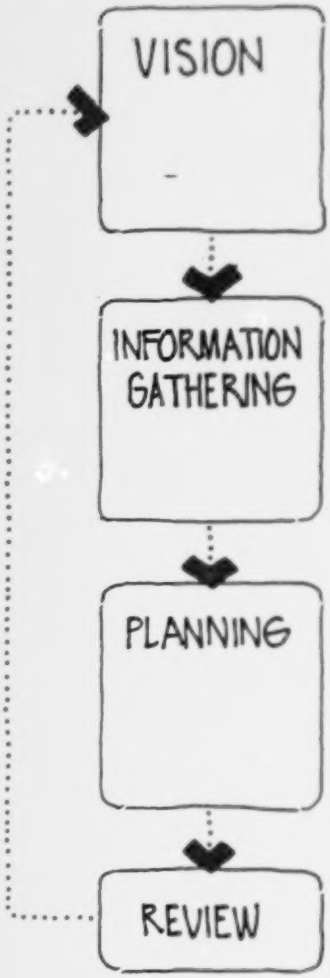
Master planning is a process by which an overall plan for the physical environment of a school, buildings and site is developed and reviewed. Master plans contain drawings as well as schedules showing the proposed time of commencement and completion of the various stages of a school's development.

> *....Master Planning - a process by which the physical environment of the school is planned and reviewed....*

Master plans are not static - they need to respond to changing requirements and should be regularly updated.

Both the educational program and business needs of a school should be taken into account in the development of a Master Plan.

Master planning is a process aimed at encouraging school planning authorities to undertake a careful and detailed examination of all the factors involved in planning building and managing a school. Poor planning leads to the development of inadequate facilities, a poorly planned site or expensive recovery programs for the school a few years later.



1.2. An Overview of the Planning Process

There are three basic steps in the Strategic Plan for the preparation of a Master Plan:

1 The Vision Phase

2 The Information gathering phase - see "Prerequisites for Master Planning" in the diagram which follows.

3 The Planning Phase.

1.2.1. The Vision Phase

The purpose of the vision phase is to identify the motivation for commencing and continuing to operate the school and to clearly state its underlying philosophy. Developing a master plan without a clear understanding of the school's vision often leads to a building that poorly meets the needs of the school.

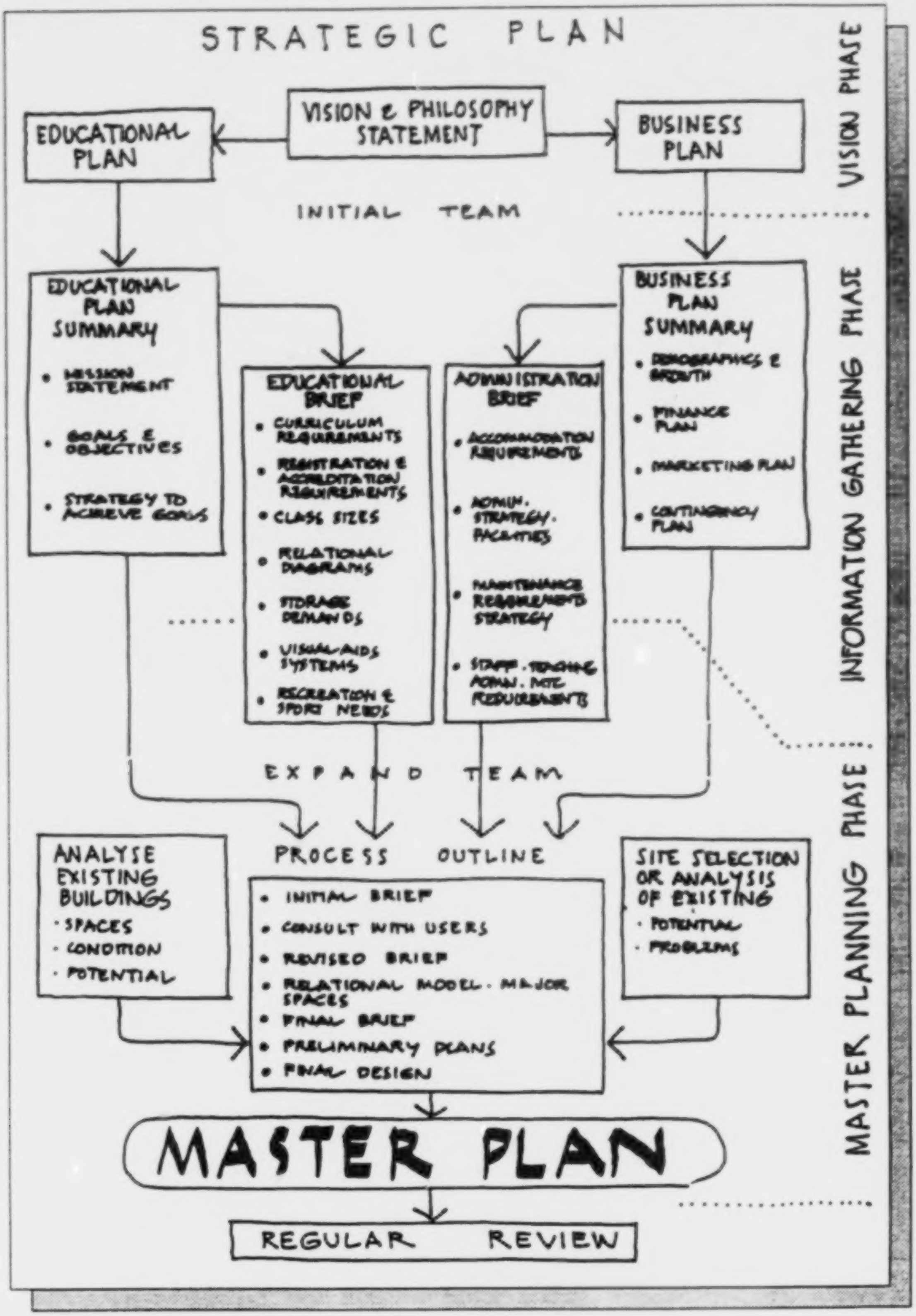
Those who established the school did have a vision, however well it may have been stated. It may be documented in your school's history, perhaps illustrated in the library memorabilia cabinet, or simply told in the traditions of the school. This vision or philosophy may or may not be continuing to guide the development of the school.

The vision inevitably evolves as the years progress. The master planning team should understand that vision and know how the school's philosophical position has affected the building program to date.

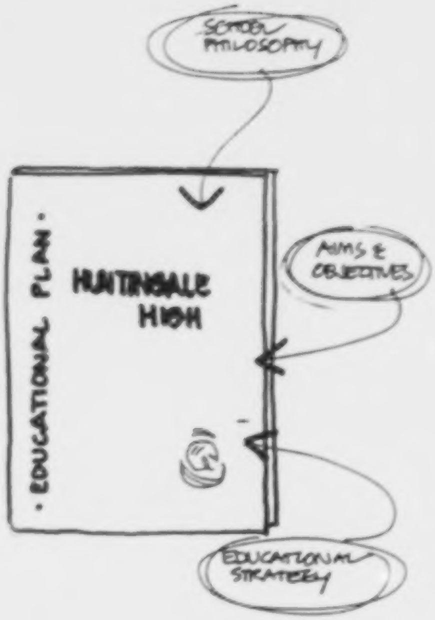
If a school continues to occupy the original buildings associated with the early days of its development, the very fabric of the school will reflect that vision.

A school designed initially in a certain style (reflecting philosophy or a particular educational need), should maintain that style wherever possible throughout its latter stages of development so that the ongoing development is coherent and has continuity with the original design and culture.

The vision will often be set down in a mission statement. This should be a general and succinct statement of purpose and philosophy of the school, expressed in terms understood by all participants in the school community. It should not be couched in educational jargon.


STRATEGIC PLAN
VISION & PHILOSOPHY STATEMENT
EDUCATIONAL PLAN
BUSINESS PLAN
VISION PHASE
INITIAL TEAM
EDUCATIONAL PLAN SUMMARY
• MISSION STATEMENT
• GOALS & OBJECTIVES
• STRATEGY TO ACHIEVE GOALS
EDUCATIONAL BRIEF
• CURRICULUM REQUIREMENTS
• REGISTRATION & ACCREDITATION REQUIREMENTS
• CLASS SIZES
• RELATIONAL DIAGRAMS
• STORAGE DEMANDS
• VISUAL AIDS SYSTEMS
• RECREATION & SPORT NEEDS
ADMINISTRATION BRIEF
• ACCOMMODATION REQUIREMENTS
• ADMIN. STRATEGY. FACILITIES
• MAINTENANCE REQUIREMENTS STRATEGY
• STAFF. TEACHING ADMIN. ETC REQUIREMENTS
BUSINESS PLAN SUMMARY
• DEMOGRAPHICS & GROWTH
• FINANCE PLAN
• MARKETING PLAN
• CONTINGENCY PLAN
INFORMATION GATHERING PHASE
EXPAND TEAM
PROCESS OUTLINE
ANALYSE EXISTING BUILDINGS
· SPACES
· CONDITION
· POTENTIAL
• INITIAL BRIEF
• CONSULT WITH USERS
• REVISED BRIEF
• RELATIONAL MODEL. MAJOR SPACES
• FINAL BRIEF
• PRELIMINARY PLANS
• FINAL DESIGN
SITE SELECTION OR ANALYSIS OF EXISTING
· POTENTIAL
· PROBLEMS
MASTER PLAN
MASTER PLANNING PHASE
REGULAR REVIEW

The vision statement may well continue to be refined while the other phases are unfolding.


SCHOOL PHILOSOPHY
• EDUCATIONAL PLAN •
HUNTINGALE HIGH
AIMS & OBJECTIVES
EDUCATIONAL STRATEGY

1.2.2. Prerequisites for master planning

Before any development is contemplated there are two very important prerequisites. Some school funding bodies recommend, if not insist, that these be in place at the time of considering a capital grant application. These are an Educational Plan and a Business Plan.

Educational Plan

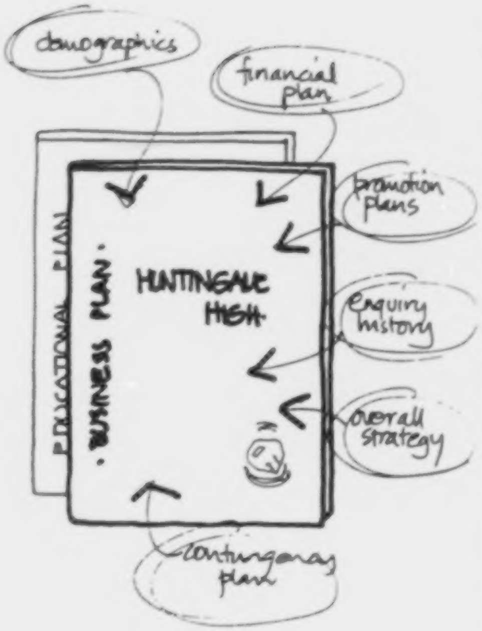
The educational plan is a document or series of documents which sets out the philosophy of the school, its aims and objectives and the educational strategy to be adopted to achieve those aims and objectives. It will have a significant bearing on the whole approach to development of the school's facilities.

The primary focus of this plan is to guide the educational staff in the development of the school's educational program. It will be prepared by the educational staff of the school or, if the staff has not been appointed, those of the founding body who have expertise in this area. As it is one of the most important documents of the school it will have, or should have the endorsement of the school council.

If there is no such document, the master planning team should urge the school board or council to produce one prior to the commencement of the planning process. The information may already be in existence but may not be called an "Educational Plan".

A sample summary of the issues that could be contained in an Educational Plan is in Appendix 9.1. The summary covers:

- School Philosophy
- School Aims and Objectives
- Educational Strategy


demographics
financial plan
promotion plans
enquiry history
overall strategy
contingency plan
EDUCATIONAL PLAN
• BUSINESS PLAN •
HUNTINGALE HIGH

Business Plan

The purpose of the Business Plan is to provide an overview of the school's proposed strategy and, most importantly, to guide the administrative staff and educational leaders in ensuring the school's financial viability. It will be guided by the educational plan and will also incorporate demographics, funding sources and marketing. Briefly, it includes:

- demographics
- enquiry history
- financial plan
- promotional plan
- overall strategy
- contingency plan

At the minimum, it must address the issue of financial viability. The Business Plan is summarised in Appendix 9.1.

ENROLMENT PREDICTION

Population prediction

When planning a school facility, it is vital to have information on the demography of the school's catchment are. Information needed will include:

- age structure
- population prediction, local government sources as well as Australian Bureau of Statistics
- birth rate and number of births
- residential density and development pattern
- government and non-government school enrolments
- transport in the area
- local government sources of information
- DEET ceilings on school enrolments, if any

These figures provide the basic information for predicting school population and the demand for facilities. the demand will be further affected by:

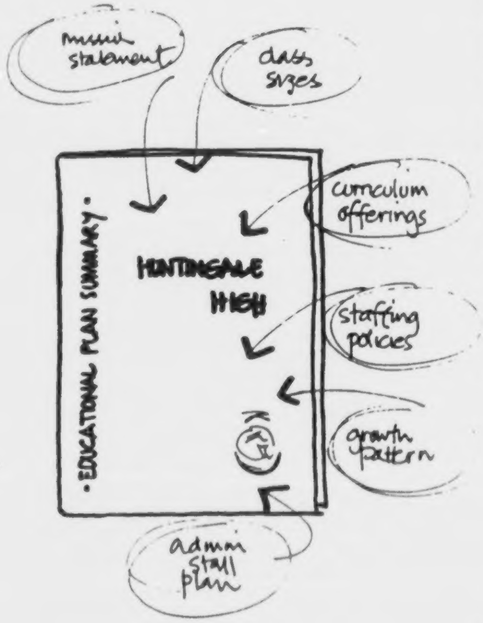
- enrolment of students not resident in the catchment area
- pattern of student retention
- changing of land use patterns (re-zoning)
- the socio-economic level of the community
- the inclination of the community to use non-government schools

1.2.3. Information Gathering Phase

The purpose of this phase is to gather the information needed for the team to commence planning. The team should defer any decision making related to planning until certain essential data is obtained (although the data will be augmented as the plan unfolds and develops). The following is a summary of essential components:

- Educational Plan Summary
- Educational Building Brief
- Administration Brief
- Business Plan Summary

The suggested content of these documents is summarised below.



Educational Plan Summary

The Planning Team will need to have a condensed version or summary of the Educational Plan. The best people to prepare this are the educational staff who will, no doubt, have prepared or at least had a significant input into its preparation.

The purpose of this summary is to isolate the key elements of the educational plan that directly and specifically affect the building program. The planning team will need this information to properly understand the nature of the facilities to be provided.

The essential elements of the Summary of the Educational Plan will be:

- School Philosophy, summarised in a Mission Statement relevant to the particular project - refer to Education Plan in Appendix 9.1
- School aims and objectives as are relevant to the project in hand and condensed into a set of specific goals and objectives. The following is a guide to what these may be:
  - ✓ ultimate school size including class sizes
  - ✓ the students to be enrolled (boys, girls or co-ed) and age range
  - ✓ curriculum offerings
  - ✓ staffing policies
- Strategy to achieve Goals and Objectives
  - ✓ growth pattern of enrolment
  - ✓ plan for introduction of various curriculum offerings
  - ✓ plan for growth of administration staff in parallel with growth of school
  - ✓ plan for introduction of general purpose areas such as libraries and multi-purpose halls.

Educational Building Brief

The Educational Building Brief specifies the space needs of the school. It will provide a list of spaces, specific requirements of those spaces as well as the overall sizes. It will require considerable

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time input to achieve a satisfactory brief. For the benefit of those outside the education profession, it should state clearly the needs of the school. This has two principle benefits:

- it requires the school staff to be specific and therefore to think carefully about what is being documented
- it leaves few questions in the minds of the people charged with the responsibility of preparing the design.

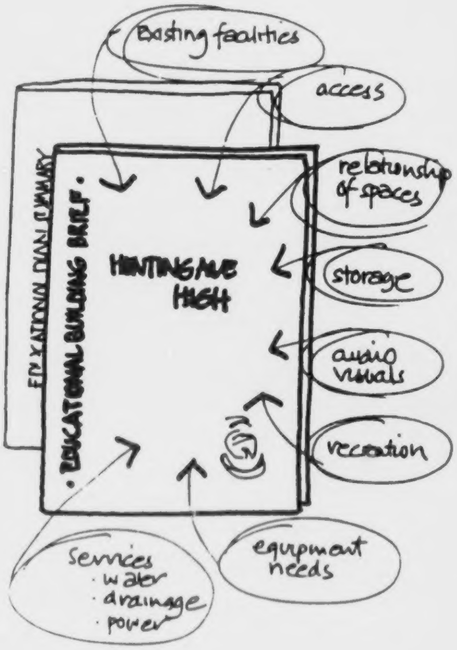
The master planning team would benefit from critically analysing the existing facilities and visiting other similar schools to ensure that the proposed new facilities are suitable for the perceived purpose.

The principal design consultant (usually an architect) can assist in this process in consultation with educational professionals.

Existing facilities

Before preparing the Educational Building Brief careful and detailed study should be undertaken of existing facilities with a view to documenting whether:

- it is structurally sound
- it is a healthy and safe environment, well ventilated and free from hazards
- it is efficient to operate
- it supports the school program
- its location is convenient for the users
- the space is optimally used
- it is the right size
- it can be modified
- its acoustics (sound ingress, reverberation level) are satisfactory
- the lighting, both natural and artificial, is satisfactory (e.g. no glare from windows)
- there is adequate display space
- there are adequate storage facilities
- all spaces are accessible to users (e.g. are people with disabilities able to move freely to all areas?)
- finishes are durable
- the building is well maintained
- the building is lacking in aesthetic appeal

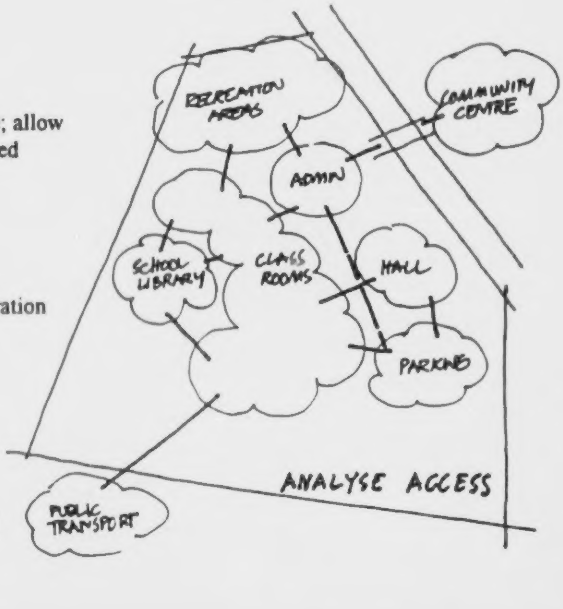

Existing facilities
access
relationship of spaces
storage
audio visuals
recreation
equipment needs
Services
· water
· drainage
· power
EDUCATIONAL PLAN SUMMARY
· EDUCATIONAL BUILDING BRIEF ·
HUNTINGALE HIGH

The users should highlight only the deficiencies at this stage; allow a range of options to be explored by the designers. Unexpected solutions often emerge.

Access

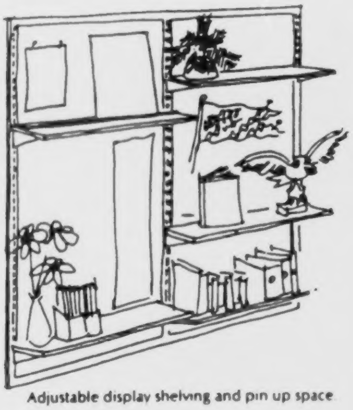
The Educational Building Brief will require careful consideration of the following access issues:

- student access to site
- student movement patterns within the site


RECREATION AREAS
COMMUNITY CENTRE
ADMIN
SCHOOL LIBRARY
CLASS ROOMS
HALL
PARKING
PUBLIC TRANSPORT
ANALYSE ACCESS

- vehicle access to site (special consideration should be given to bus access)
- vehicle movement on site (e.g. deliveries)
- positioning of staff rooms vis a vis classrooms

To establish space needs, planners must give careful consideration to:



Adjustable display shelving and pin up space

- how staff will be accommodated e.g. centralised or distributed staff rooms, whether staff teach across all grades or are limited to specific segments of the enrolment
- needs of the curriculum - specialist facilities that are required
- facilities needed to satisfy registration and accreditation requirements
- the relationship of spaces to each other
- services (water, power, light and gas) requirements
- class room sizes and use (normal classroom, seminar - lecture - demonstration - practical)
- storage requirements
- audio visual facilities, chalkboard, whiteboard, overhead projectors, television/video facilities, display areas
- active and passive recreation
- sporting facilities and ground requirements, school and community use
- changing national demands for curriculum and training

This list will expand as the planning group refines its proposals. The planning group will need to make submissions to the school authority from time to time to try out ideas and to receive feedback – a process that will often raise further questions. The responses to these questions provide important clues to the final shape and pattern of development of the school.

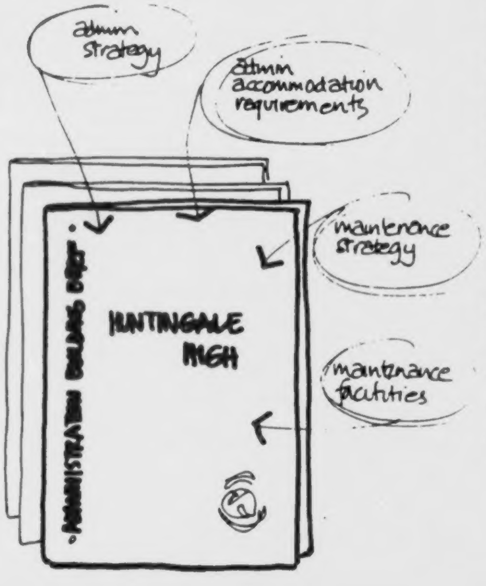
In addition to the above, the planning team must consider the requirements of Commonwealth and State government funding programs, if such funding is sought. An overview of these programs can be found in Appendix 9.8.

Further details regarding these programs can be obtained from the *Commonwealth Programs for Schools - Administrative Guidelines* published annually by the Department of Employment Education and Training (DEET) and from state education funding bodies. The Block Grants Authorities (BGAs) will also be able to provide useful information. Details on these bodies are in Appendix 9.3.

Administration Building Brief

In addition to the educational staff space requirements, the needs of administrative staff must be established. They include:

- accommodation requirements and standards
- administration staff facilities - centralised or dispersed
- maintenance facilities



- whether maintenance staff will be employed directly or by subcontract
- machinery, workshop
- low initial cost (high maintenance) or high initial cost (low maintenance) - decision required.

Business Plan Summary

The Business Plan Summary will include:

- demographics and growth
- financial plan
- marketing plan
- contingency plan

These points incorporate rates of growth, planned school size, curriculum requirements, staff requirements, projected budget surpluses and availability for debt servicing, projected debt levels and control, bank lending policy, expected government assistance for capital development (grants and subsidies) and an assessment of the fund raising capacity of the school. This information will have a direct impact on the school's facilities planning.

Similarly the projected costs of planned buildings will have a direct impact on business plans. For example, fee levels may need to be increased or the appointment of certain staff members delayed in order to finance buildings crucial to registration requirements. Cost is related to both the numbers and type of buildings required.

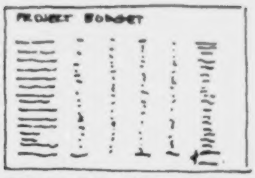
The planning team may also be constrained by financial considerations and thus may need to modify existing plans. For example, some buildings not required for registration purposes may be delayed to later stages; or specific-purpose facilities may have to be used temporarily for general purposes.

The business plan will undergo various changes as the master plan evolves. For example, as building professionals provide cost inputs, the rate at which the project develops may need to be adjusted accordingly; or as demographic information emerges, a change in emphasis, say, on different age groups, may be required.

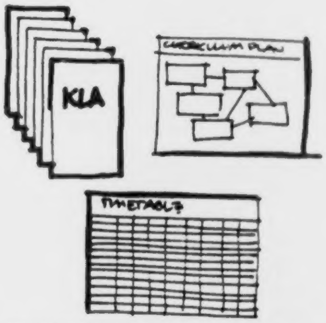
1.2.4. The Planning Phase

The Planning Phase is best described as four distinct activities:

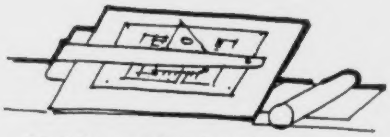
- Assembling the team - the people with relevant and varied skills who will comprise the planning team (refer 1.3)
- Assigning the tasks - delegating responsibilities to the various members of the team (refer 1.4)
- Program of meetings - preparing a program with adequate time to complete the various tasks while maintaining enthusiasm and drive (refer Scheduling Time 1.5)
- Setting key targets - establishing important milestones (refer "Setting Key Targets" 1.6)



FINANCIAL PLANNING



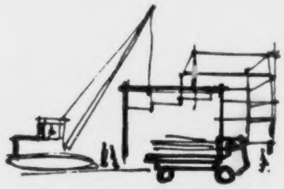
EDUCATIONAL ADMINISTRATION



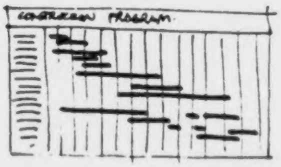
DESIGN PROFESSIONALS

BCA 1
BCA 2
BCA 3
TP

PLANNING PROFESSIONALS



CONSTRUCTION PROFESSIONALS



CONSTRUCTION PLANNING

In addition to the above at various stages the team should agree that reviews will take place.

- Review process - establishing a series of review processes, preferably involving people outside the team who have relevant expertise.

The planning process is much the same, whether the project is for the development of an entire master plan or for a specific project.

1.3. Assembling the Team - the skills required by the team

To carry out its work effectively, the planning committee will require members with a variety of skills and experience. The various user groups should also be represented on the committee. In this way, the design intent and outcome can be conveyed to the users (mainly the school staff). Greater commitment and a sense of ownership by the teaching professionals will result from their involvement in the planning process.

The school should aim to include the following qualities and experience on the team:

- school council and management (1.3.1)
- educational leadership and administration and curriculum development (1.3.2)
- building design, construction experience and town planning (1.3.3)
- financial planning (1.3.4)
- discussion leading (1.3.5)
- secretarial skills (1.3.6)

This list is developed below in more detail.

1.3.1. School council and management representation

The master planning team should incorporate representatives from both the "owner" (the school council - the policy makers) and "management" (the school principal and staff - the executive).

The primary task of the school council representatives is to inspire and oversee the maintenance of the vision. The key person in this process will be the Principal who should bear the responsibility of conveying to the staff the policy of the Board or Council.

The primary task of the school staff including the principal and business manager/bursar is to ensure that detail requirements are incorporated, and that the end result will satisfy the current as well as future needs of the school.

Prior to the project taking shape there must be general agreement as to vision and general educational approach. It should be understood that in trying to reach agreement the process will become quite intense and will, at times, test the best working relationships.

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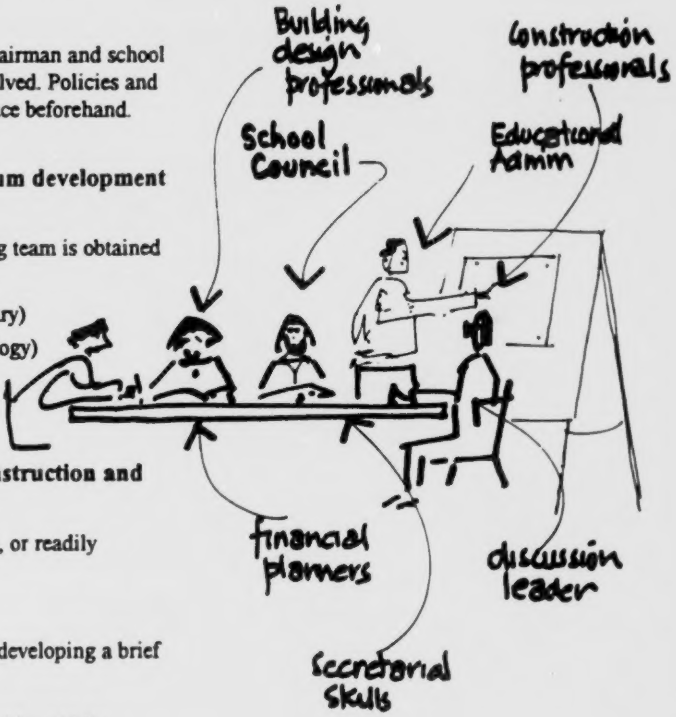
This is a time for the board or school council chairman and school principal to agree as to how conflict will be resolved. Policies and strategies for conflict resolution should be in place beforehand.

1.3.2. Experience in education, curriculum development and education administration

Try to ensure that representation on the planning team is obtained from the following areas:

- all levels of teaching (Primary and Secondary)
- educational specialists (e.g. library, technology)
- curriculum planning
- educational administration



1.3.3. Experience in building design, construction and town planning

Professionals such as the following should be on, or readily accessible to, the team:

- Architects

Architects are usually well equipped to assist in developing a brief and in engaging other consultants.

New schools operating with limited budgets should avoid the temptation to plan alone even with the assistance of a "friendly builder". Significant skills are required for master planning and these are not normally the skills relevant to the construction process - the domain of the builder.

By employing consultants at an early stage, their advice can provide input and help in the resolution of issues, often overlooked by school management teams who are rarely experienced in such matters.

It is wise to engage architects with experience in educational facilities - advice at preliminary stages is usually available gratis as it gives an opportunity for the professional to establish a link to a possible client.

On the other hand a fresh and inspiring approach can sometimes emerge when the consultant is not burdened by ready made solutions which can result in repetetive and uninspiring designs.

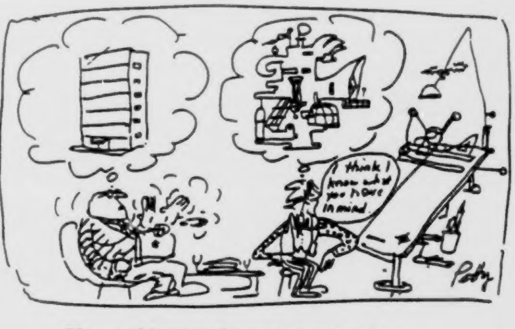
- Builders

Building contractors with experience in projects of a similar size to the planned facility are best equipped to bring appropriate advice. Trades experience without the experience of major contract management is of limited benefit.

- Construction management

There is a range of approaches to contracting the construction work and schools are attempting more and more to undertake work other than by the traditional tender process. In these cases it is important to use professionally qualified and experienced personnel.

Construction management is covered in detail in chapter 6.


I think I know what you have in mind
Petty

Use architects who are creative but who also communicate clearly.

Cartoon by Bruce Petty

Used by permission - Appreciation to the NSW Chapter of the Royal Australian Insititute

- Services and structural engineering consultants

Services include electrical, hydraulic (i.e. water supply and drainage, including stormwater and sewerage), mechanical (ventilation and air conditioning), security and fire. The advice of professionals in these areas can be helpful even prior to choosing a site (e.g. to assess whether a site where no sewer is available can be serviced by a rising sewer main).

- Quantity surveyors

Quantity surveyors and cost management consultants are usually used in conjunction with a multi-disciplined team of professionals to:

- provide advice at the preliminary design stage
- cost various options
- guide the project through to completion within budget.

Their task is to keep all, including the school, informed as to progress – not only at the various design stages but also through the construction stage. This permits adjustments where necessary and allows the monitoring of the cost of variations which are inevitable in any building project.

- Town planning

Town planners generally work for local council or are in private practice. They are concerned with the use of land and maximising its potential to suit the needs of the community. Their familiarity with planning codes and concepts is invaluable, particularly in choosing a site and in negotiations with the local authorities for approvals.

1.3.4. Financial planning

Accountants or professional business consultants with expertise in financial management and planning, lending policies and budgeting are a valuable asset in establishing long-term financial policies and strategies. Experience in educational financial planning is of particular value in making the most of the funding formulae in the school's financial plan.

1.3.5. Discussion leader and summarising skills

Without the skills of a competent discussion leader, team work could very quickly degenerate and founder because of a lack of direction and purpose. Similarly without good chairmanship one or two strong team members may tend to dominate, and overshadow valuable input from other team members.

These team leading skills are often available from those in an emerging profession called Value Managers. (Refer section 1.7).

1.3.6. Secretarial and administration skills

Records succinctly kept, filed, accessible, and approved are fundamental to the success of the team. Much time can be saved by having ready access to decisions and background data.

1.3.7. Other consultants

Block Grant Authorities (BGAs)

The BGAs usually comprise a panel of experienced professionals in the financial, educational, design and construction professions. These experts usually anticipate and welcome being consulted, and should be consulted early in the planning stage. However, experienced personnel associated with the BGA committees are not able to provide advice for sustained periods. Thus, depending on the size of the project envisaged, schools should consider appointing a panel of consultants.

A complete list of BGA contacts is provided in Appendix 9.3.

Other Schools

It is helpful to visit comparable schools as early as possible. Follow up that visit with specific and detailed discussions at the detail planning stage.

Association of Independent Schools (AIS) NSW - Consultancy Team

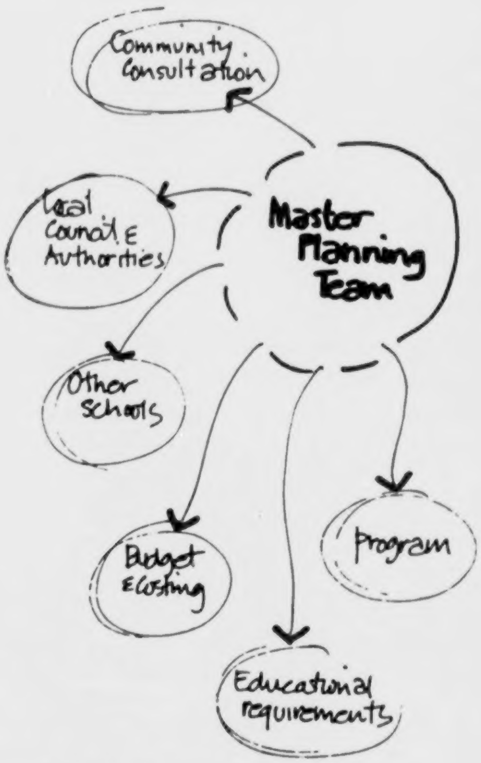
AIS NSW is establishing a panel of consultants with relevant expertise across all aspects of the educational planning process, including the provision of facilities planning. This advice is available to all schools, including non-member schools. The members of this panel provide their advice as independent consultants but through AIS NSW. There is usually a fee attached to the provision of such advice.

1.4. Assigning the Tasks

Once the team has been assembled specific tasks relevant to the various skills should be assigned to the appropriate team members. These will relate to gathering information and making contact with appropriate authorities. They will also need to prepare submissions for the planning team in respect of their area of expertise.

As the team is likely to be fairly large a number of sub-groups is recommended to incorporate representatives of school staff, professional and school community wherever possible.

This process of dividing up the work should be handled with care to avoid wasting time. When tasks are delegated it is wise to encourage the larger group to either receive or reject the advice. To spend a lot of time in the larger committee re-hashing what the sub-group has done is likely to discourage and bog-down the progress of the larger group.



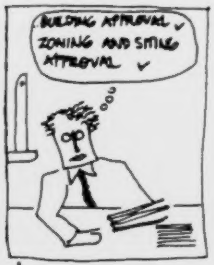
ASSIGNING TASKS

1.5. School and Community Consultation

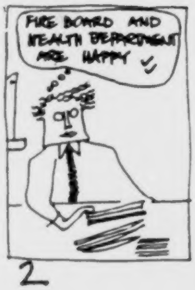
Staff

The process of consultation with staff is likely to be the most time consuming. The effort expended in this area, however, is repaid many times over if the detailed consideration and needs of the professional teaching staff are taken into account. The advantages are:

- the staff are encouraged to think in detail as to their requirements
- the planners develop a greater appreciation of the people for whom they are designing
- the staff develop a greater sense of ownership of the outcome. Even if the end result is deficient in some respects there will remain a greater sense of commitment to make the solution "work"


BUILDING APPROVAL ✓
ZONING AND SITING APPROVAL ✓

1.


FIRE BOARD AND HEALTH DEPARTMENT ARE HAPPY ✓

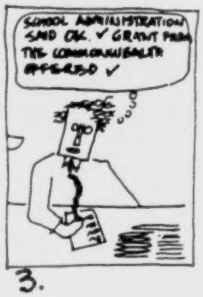
2

Parents

Depending on the kind of school, the degree of parent and community involvement will vary. This will depend on the expectations of parents as to the extent of involvement required or necessary.

Among interested parents, schools are likely to find people skilled in

- education
- the construction industry
- finance
- management
- promotion - advertising

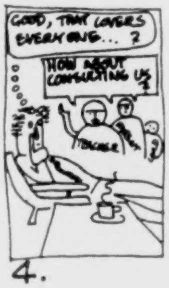

SCHOOL ADMINISTRATION SAID OK. ✓ GRANT FROM THE COMMONWEALTH OFFERED ✓

3.

Parents also tend to make up the membership of committees such as

- maintenance
- uniform/clothing pool
- canteen
- promotion

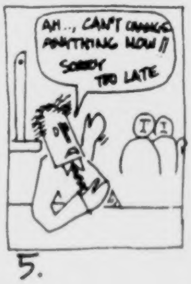
and play many other supporting roles within schools.


GOOD, THAT COVERS EVERYONE... ?
HOW ABOUT CONSULTING US ?
TEACHER

4.

Such parents should be given the opportunity to have input into the planning process.

This can be done best by seeking submissions as to requirements and then reviewing these with the planning team to check the appropriateness of the response.


AH..., CAN'T CHANGE ANYTHING NOW !!
SORRY TOO LATE

5.

Company members

If the school is a company or an association, individuals within the membership may also be able to contribute. A school development is a major investment and members will be vitally interested.

At annual general meetings the major steps should be outlined and comments sought. A subcommittee of the council or board could be formed to keep the members advised of major developments.

Students

Both current and former students should be included in the planning process. At minimum, a representative from the past

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students or alumni association should be involved. The current senior student could also be invited to participate. The student council should be invited to make a submission.

This process of wide consultation develops a sense of ownership and involvement so that when the project is in use there will be a commitment to make it work.

Neighbours and community

Neighbours and community will have an interest in issues such as:

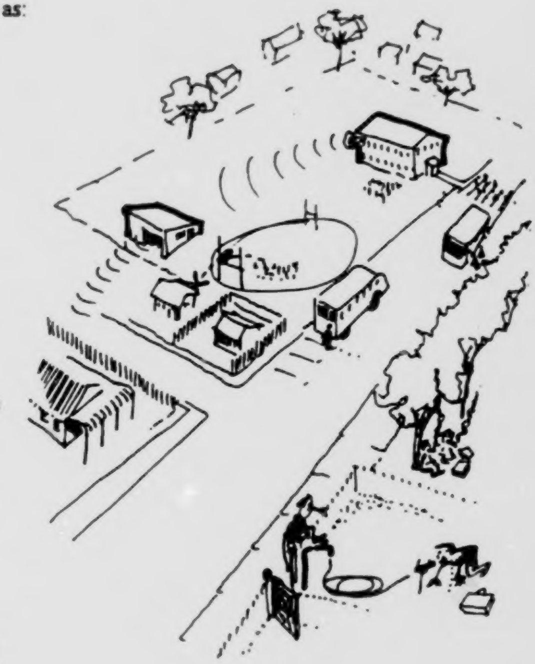
- vehicular traffic on roads
- noise generated by children at play
- after school hours activities
- disturbance by truant or misbehaved children
- machinery noise from workshops and from grounds maintenance
- impact on environment, e.g. increase in drainage from non-absorbent surfaces increasing run-off
- impact on services - change in water pressure
- impact on local bus and train services--increased usage, crowding.

On the other hand the school may be able to offer support to the community by providing access to:

- libraries
- workshops after hours for hobbies
- local interest groups
- adult education programs - e.g. computers
- sporting facilities, gymnasium

For these reasons it is important to seek the support of the local community at an early stage to determine the level of opposition and/or interest. Should the advantages be seen to somewhat offset the disadvantages, the opposition from the local community (which can affect council approval) can be minimised.

Time must be allocated for interviews, public awareness programs and consultations.



SCHOOL & NEIGHBOURHOOD
potential for conflict

1.5.1. Allow for consultation with relevant authorities

A wide range of authorities and government agencies affect the development program:

- Local municipal council
- State government educational authorities who regulate space and health issues including toilet accommodation
- State government interest subsidy schemes which may have space standards
- Commonwealth Government global guidelines
- Commonwealth Capital Grants programs as operated by BGA's may have other guidelines such as room counts
- Employment regulations, (provision of rest, food, first-aid and toilet accommodation)
- State Government planning regulations/zoning

- Water supply and drainage
- Electricity supply authority
- Gas supply authority
- Roads and traffic authority
- In certain areas special requirements may apply such as mining subsidence regulatory authorities

Adequate time and provision of relevant expertise needs to be allowed for in the planning process.

1.5.2. Allow for securing relevant approvals

In addition to allowing for consultation with the authorities it is also important to allow for securing of the necessary approvals.

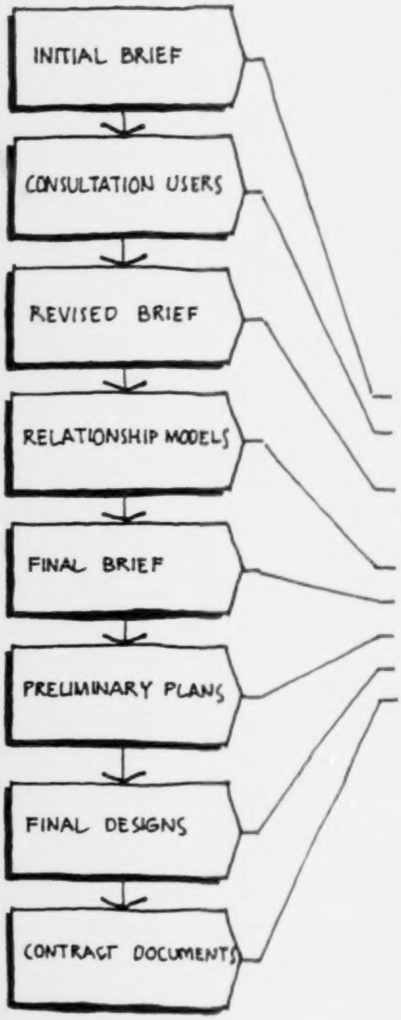
Approvals cannot always be applied for concurrently – some approvals are contingent on others. For example before the local council grants approval, it may first require certain other authorities to provide input and grant approval, e.g. roads and traffic, water and sewerage.

This process can take months, particularly if there are legal disputes which must be settled in court.

1.6. Setting Key Targets

Key targets pertain to the specific objectives to be achieved, including all necessary approvals.

The key targets will vary according to the nature and complexity of the project. A sample outline is given below:



- initial brief based on "first cut" assessment of requirements.
- consultation with users including students, as well as staff, parents and community.
- revised brief.
- relationship models.
- final brief.
- preliminary plans.
- final design.
- contract documents.

Initial Brief

This will describe the school in broad terms, by stages, listing the number and kinds of class facilities required, enrolment numbers and staff, the external facilities such as play areas, administration requirements, access requirements to transport facilities.

Consultation

This process requires a series of meetings to draw together the various groups likely to be associated with the school. It provides opportunity for each to make suggestions and recommendations as to how the building should be equipped and laid out, the staging needed and the community use potential.

The information from these groups needs to be "filtered" by the school board before becoming information on which the planners are required to act in preparation of the design.

Revised Brief

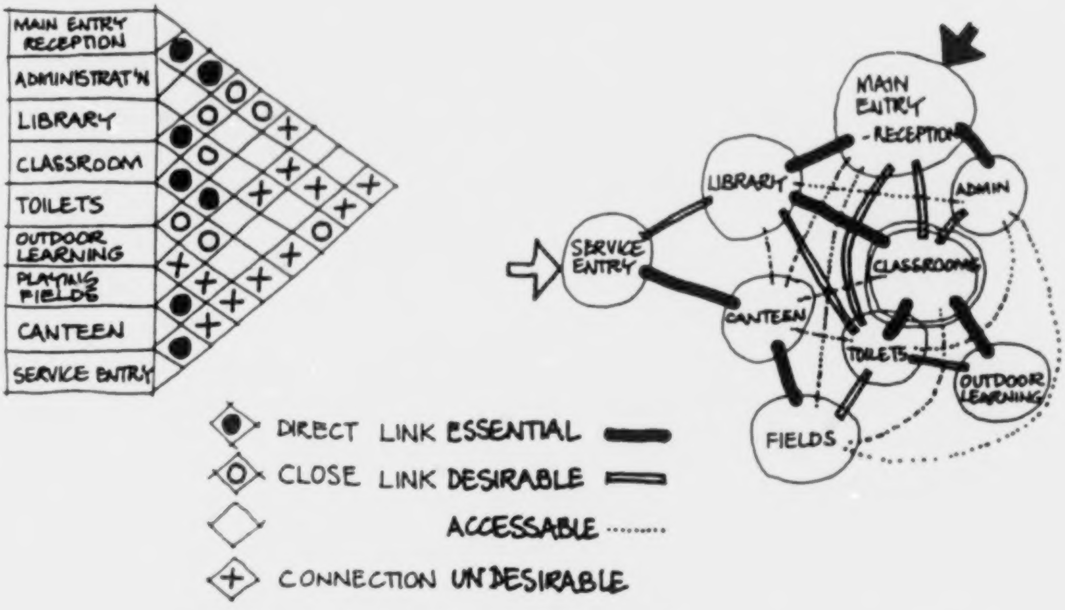
The revised brief will arise out of the "filtering" process referred to above. It may contain additional information prompted by the consultation process.

Relationship Models

In this phase the school senior staff begin to suggest priorities as to which rooms or areas best relate to one another, the areas that need to be isolated and those that to be in close proximity, (e.g. transport access, to playing fields and so on).

This process is probably best carried on in company with trained personnel who are skilled in consultative leadership and probably someone not close to the users (not on staff).

The output from this process is best illustrated in diagrammatic form. Any submissions making use of architectural plans except by way of illustration should not be included. The use of diagrams at this stage assists considerably in keeping thinking clear as to relationships that spaces have to each other. Detail relating to placement of windows and doors should be left to the architects and other construction professionals.


MAIN ENTRY RECEPTION
ADMINISTRAT'N
LIBRARY
CLASSROOM
TOILETS
OUTDOOR LEARNING
PLAYING FIELDS
CANTEEN
SERVICE ENTRY
MAIN ENTRY - RECEPTION
LIBRARY
ADMIN
SERVICE ENTRY
CLASSROOMS
CANTEEN
TOILETS
OUTDOOR LEARNING
FIELDS
DIRECT LINK ESSENTIAL
CLOSE LINK DESIRABLE
ACCESSABLE
CONNECTION UNDESIRABLE

RELATIONSHIP MODELLING

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Final Brief

The final brief will be developed from the resolution of the relationships model.

A master plan which will be developed from the final brief will contain the following documents:

- site plan
- buildings in general form (not detailed)
- stages of building/development program
- broad principles of landscape design including playing areas, fields, courts, major planting areas
- major circulation patterns
- general principles of vehicle movement and parking
- faculty relationships
- major service diagrams

Project Implementation: Once the master plan has been adopted and a specific project is proposed the process will move through the Preliminary Plan and Final Design stages.

Preliminary Plans

With the Final Brief the planner should be equipped to commence preparing preliminary plans.

Only approximate room sizes and plans in broad outline will be shown. It will be possible to determine preliminary information on building areas for costing purposes and to determine if and where soil testing is needed.

At this stage, costs may be estimated and initial budgets prepared.

Final Design

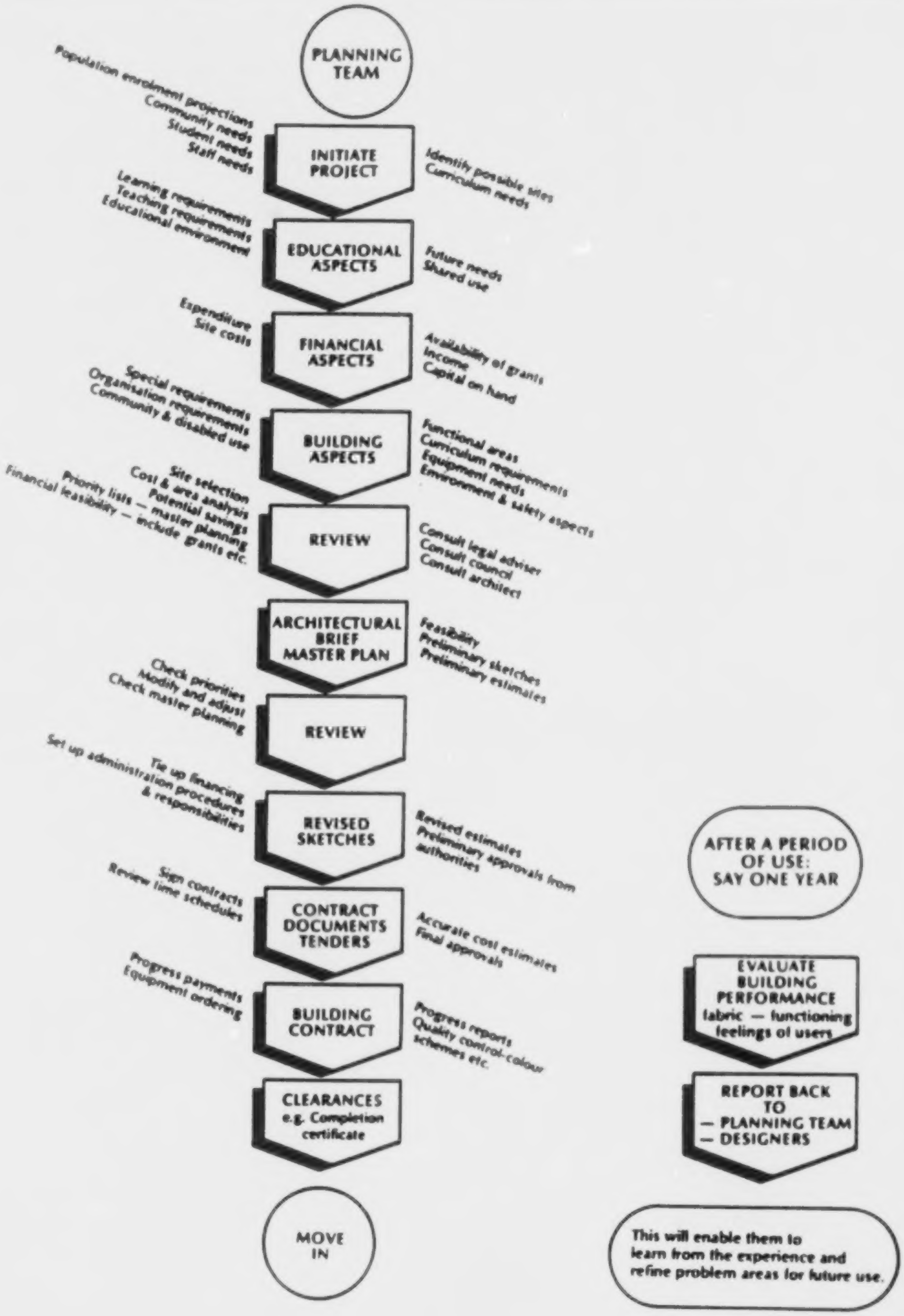
The final design may require several sequential designs culminating in one which can be endorsed by all.

- Contract Documents

By this stage a very clear understanding should exist of what is to be included in the school buildings and grounds. Nevertheless, the planning committee should check the contract documents or at least appoint someone to do this on their behalf.

The basis of this check will be the final brief. If the person checking has had a significant involvement in the planning committee this will be an added advantage. It is possible in a complex entity like a school to have overlooked matters. Reviewing the final contract documents (drawings and specification) will be useful in evaluating the design as an expression of the brief

Review Process: The master plan has a limit to its effectiveness and thus needs regular updating. Previous plans and notes of meetings are invaluable if they show the previous planning processes. Key people in schools should review these plans about every 5 to 7 years..


PLANNING TEAM
Population enrolment projections
Community needs
Student needs
Staff needs
INITIATE PROJECT
Identify possible sites
Curriculum needs
Learning requirements
Teaching requirements
Educational environment
EDUCATIONAL ASPECTS
Future needs
Shared use
Expenditure
Site costs
FINANCIAL ASPECTS
Availability of grants
Income
Capital on hand
Special requirements
Organisation requirements
Community & disabled use
BUILDING ASPECTS
Functional areas
Curriculum requirements
Equipment needs
Environment & safety aspects
Site selection
Cost & area analysis
Potential savings
Priority lists — master planning
Financial feasibility — include grants etc.
REVIEW
Consult legal adviser
Consult council
Consult architect
ARCHITECTURAL BRIEF MASTER PLAN
Feasibility
Preliminary sketches
Preliminary estimates
Check priorities
Modify and adjust
Check master planning
REVIEW
Tie up financing
Set up administration procedures & responsibilities
REVISED SKETCHES
Revised estimates
Preliminary approvals from authorities
Sign contracts
Review time schedules
CONTRACT DOCUMENTS TENDERS
Accurate cost estimates
Final approvals
Progress payments
Equipment ordering
BUILDING CONTRACT
Progress reports
Quality control-colour schemes etc.
CLEARANCES e.g. Completion certificate
MOVE IN
AFTER A PERIOD OF USE: SAY ONE YEAR
EVALUATE BUILDING PERFORMANCE fabric — functioning feelings of users
REPORT BACK TO — PLANNING TEAM — DESIGNERS
This will enable them to learn from the experience and refine problem areas for future use.

Another way of illustrating the Planning and Building Process

From "Schools Design and Use - Commonwealth Schools Commission 1982

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1.7. Value Management (VM)

Value Management is a useful planning tool that can also bring together the necessary expertise available in the community at large.

1.7.1. Definition

Value Management is a structured and systematic process for achieving the essential functions of a facility or system at the lowest possible cost consistent with required performance, i.e. to maximise value.

Underlying Value Management is the principle that there is always more than one way to achieve a desired function. Thorough and systematic examination of the alternatives will produce the most desirable outcome.

1.7.2. Purpose

The purpose of Value Management is to achieve among other things the following objectives:

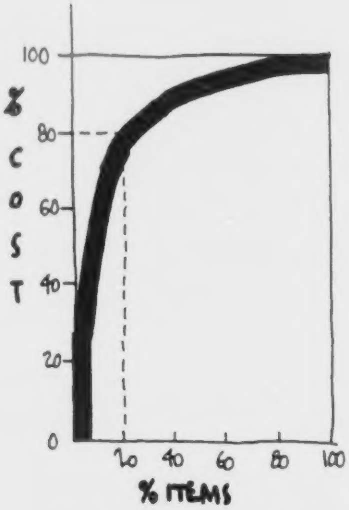
- Cost benefits maximised
- Enhanced potential for a full and comprehensive brief
- Clarified design intent for users - no surprises

1.7.3. Pareto Principle

For any project, usually a relatively small number of items will contribute to the bulk of the cost. This phenomenon is called the Pareto Principle.

The Pareto Principle is particularly relevant to VM, given the time scale over which value studies are usually undertaken. By giving primary attention to the 20% of items which account for 80% of the cost, the VM investment return is optimised.

This is not to imply that other areas of potential value improvement should be ignored. Instead it reflects the VM premise of setting activity priorities based on value opportunity.



PARETO PRINCIPLE

Diagrams and parts of the text are taken from the "Value Management Manual" published by the New South Wales Government, 1992

1.7.4. Value Management (VM) Team

The VM Team will comprise essentially two groups of people:

- people skilled in the VM process, some with expertise in the relevant field (in this case education and construction)
- key people from the planning team

Team Leader

The VM Team Leader will be a qualified VM professional with proven ability to create an environment for creative thinking and critical analysis.

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Team members

The team members will be those who are willing to give sufficient time for up to 2 days for sustained analysis and discussion. They should be open to debate and the challenging of ideas.

1.7.5. VM Outcomes

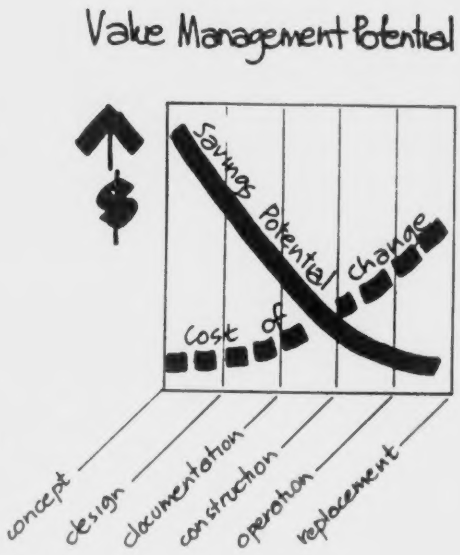
Value Management has been applied to a large number of NSW public sector projects, resulting in the following broad outcomes:

- project objectives have been tested against and aligned with corporate goals
- briefs have been analysed to separate "needs" from "wants"
- design solutions have been optimised
- communications have been improved between all parties involved in the projects, and
- a range of analysed alternatives has been presented for executive consideration and decision.

The output of a VM Team effort should be summarised in a report outlining all the issues canvassed, with recommendations for further study by the planning team.

The report should also contain an evaluation of the design including the effectiveness in the use of the resources available.

The process is of greatest value when the output is seriously considered by the principal authority for the school.



1.7.6. VM Investment return

The results of project based design value studies undertaken by one authority have exceeded expectations and projections:

- design based savings averaged 14%, while concept based savings often doubled this amount, and
- investment return varies depending on when the study takes place. At concept stage it can be as high as 200:1, at final design stag it can be around 14%. On average the return on investment (ROI) is around 50:1.

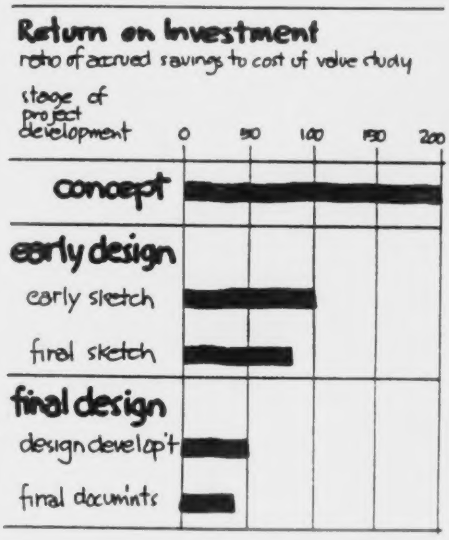
From this it can bee seen that the earlier Value Management is introduced, the greater the possible improvement in value.

1.7.7. VM Resources

There are a number of trained personnel operating now providing this expertise. The concept is being used significantly in Public Works projects in NSW. Industry is now taking hold of the concept.

There are also conferencing facilities being established to facilitate maximum involvement with minimum time input using computer technology.

List of personnel and related organisations will be found in Appendix 9.5

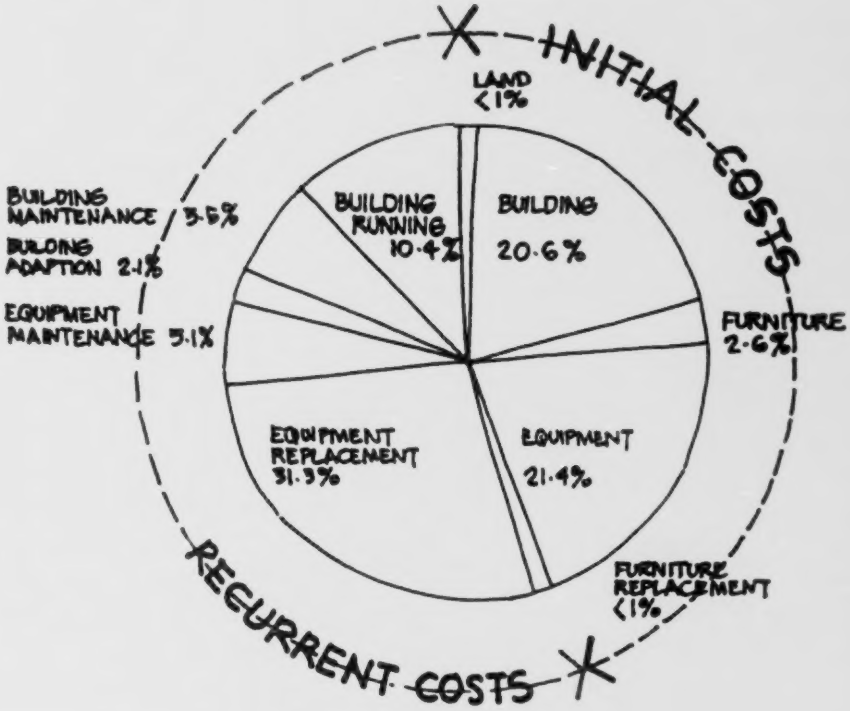


Diagrams and parts of the text are taken from the "Value Management Manual" published by the New South Wales Government 1992

1.8. Life cycle costing

Allied with the concept of value management principles is life cycle costing, in which the total cost over the life of an installation is evaluated and compared with similar installations. By this technique it is possible to determine whether a building costing more but lasting longer is in fact a better investment. All manner of costs can be included, such as lease/interest costs, running costs, maintenance. The more facts included in the equation the more realistic the final outcome.

An OECD study of a University Science building showed that the cost of equipment and its replacement represented just over half the total cost of land, building, running and maintenance. This study is illustrated in the Life Cycle Costs diagram. When staff salaries were included the capital costs shrank to 14% of the total cost. If more money were spent on the building to minimise staffing costs, the additional expenditure could be more than offset by the overall cost savings.



LIFE CYCLE COSTS

OECD REPORT · PARIS · 1990 ROGER CLYNES

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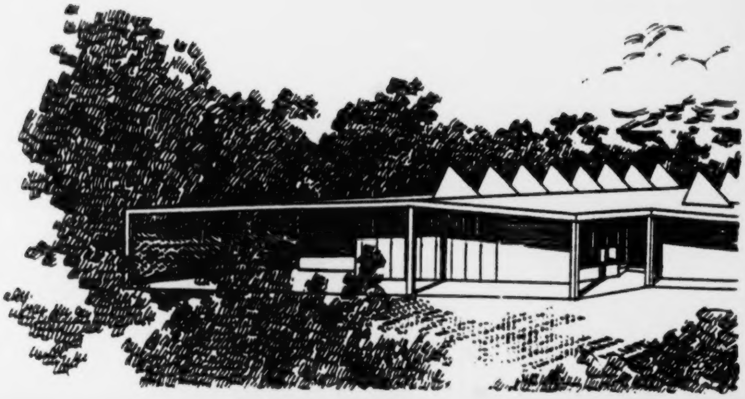


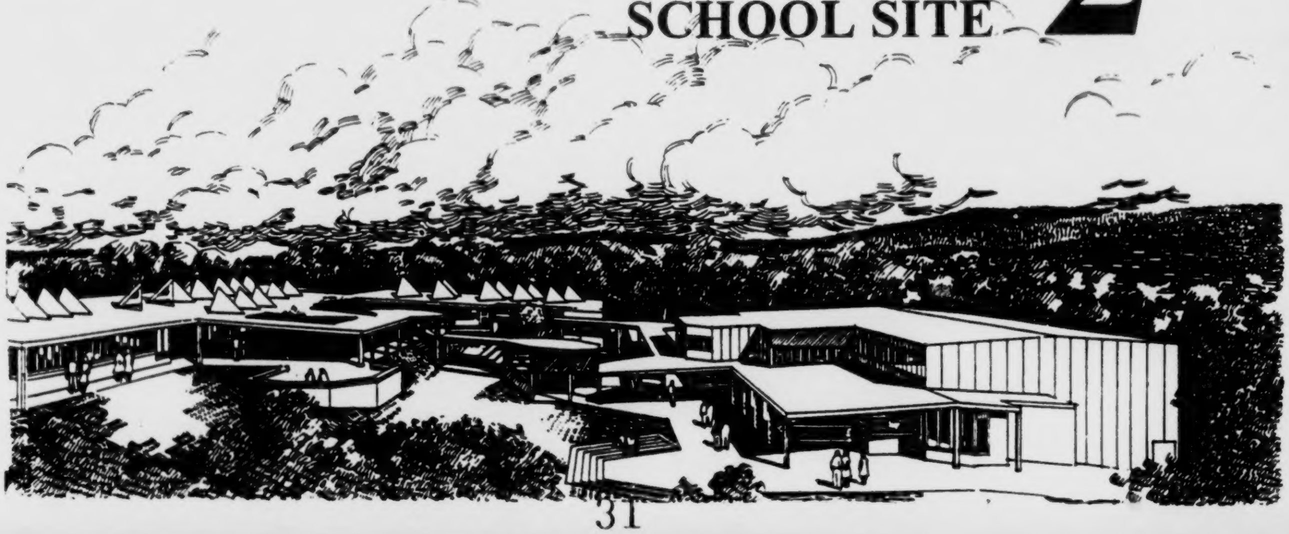
School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

MAKING THE MOST OF YOUR SCHOOL SITE

2



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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1 Introduction and Chapter 1 – Developing a Master Plan
2 Chapter 2 – Making the Most of Your School Site
3 Chapter 3 – Principles of Good School Building Design
4 Chapter 4 – Purpose Designed Facilities
5 Chapter 5 – Construction Methods and Materials
6 Chapter 6 – Managing the Construction Process
7 Chapters 7 and 8 – Technology and Managing Buildings
8 Appendices

ISBN 0 646 23758 6 refers to the complete set of 8 booklets

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

Contents of Booklet 2

2. Making the Most of the School Site

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This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

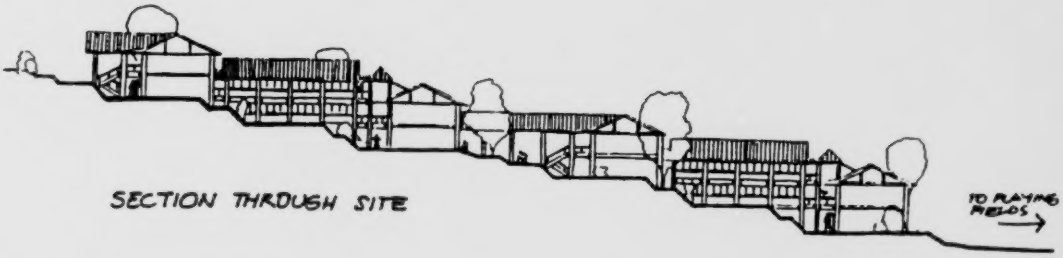
1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

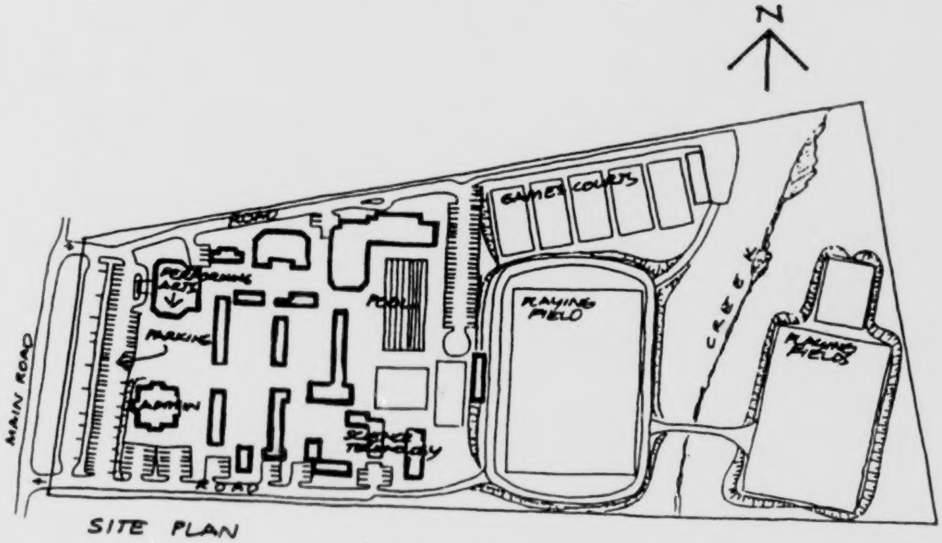
- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects


TO PLAYING FIELDS

SECTION THROUGH SITE


N
ROAD
PERFORMING ARTS
PARKING
ADMIN
POOL
GAMES COURTS
PLAYING FIELD
CREEK
PLAYING FIELDS
SCIENCE TECHNOLOGY
MAIN ROAD
ROAD

SITE PLAN

MAKING THE MOST OF A STEEP SITE
Lindisfarne Anglican Secondary School, Terranora, NSW is a very new school.
The first stage is due for completion in 1995.
The site is steep falling to a flat area at the rear of the site which will be used for playing fields.
The buildings will be constructed on level platforms formed by cutting and filling the site. They will mostly be multi-level buildings built along the contours with external stairs linking the various levels.
Roads on either side of the site allow access for construction vehicles without impeding pedestrian traffic within the site during school hours - a critical aspect for schools in the growth phase.

Architect - Brown Burling and Partners Pty Ltd

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2

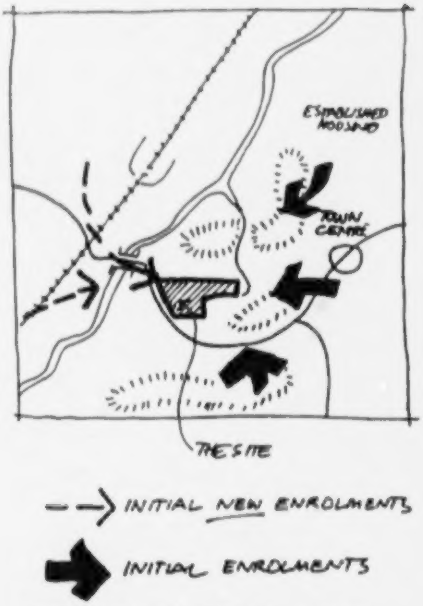
Making the Most of the School Site

2. Making the Most of the School Site

The School Site, Engineering Services and Traffic Issues

This chapter is intended to assist schools in choosing a site, and covers site selection criteria, traffic issues and site services such as water, power and sewer.

- Site Selection (refer 2.1)
- Local Governmental Regulations (refer 2.2)
- Environmental Considerations (refer 2.3)
- Transport and Traffic (refer 2.4)
- Recreation Facilities (refer 2.5)
- Site Facilities (refer 2.6)



BEFORE SELECTING A SITE & STARTING ON A MASTER PLAN MAKE A COMPREHENSIVE ANALYSIS OF THE POTENTIAL CATCHMENT AREA.

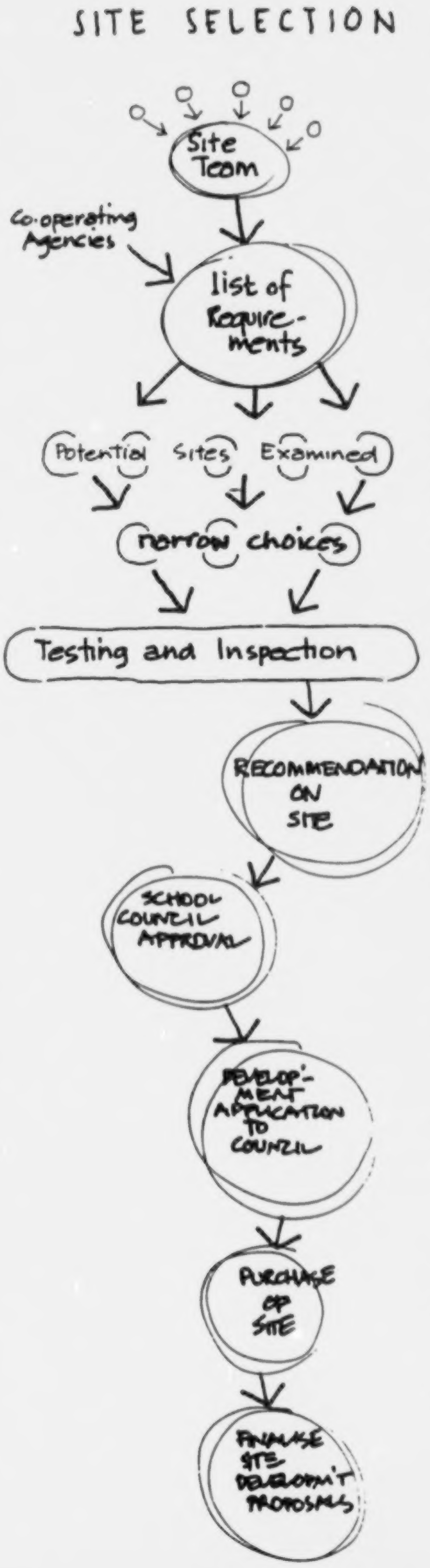
2.1. Site Selection

There are many aspects which need to be taken into account in the selection of a suitable site for a school. It would be rare for all criteria to have been met when the final selection is made. For this reason, it is important to establish a basis for ranking the various criteria prior to the decision process, so that the most important needs are met.

> *....planning for the best use of the site can be as critical as the planning of the buildings....*

The California Department of Education has established a School Site Selection and Approval Guide which may be a useful reference tool in your ranking process. A screening, ranking and evaluation procedures guide is incorporated and has been reproduced in Appendix 9.4. The following major site selection criteria are discussed below:

- Safety (refer 2.1.1)


SITE SELECTION
Site Team
Co-operating Agencies
list of Requirements
Potential Sites Examined
narrow choices
Testing and Inspection
RECOMMENDATION ON SITE
SCHOOL COUNCIL APPROVAL
DEVELOPMENT APPLICATION TO COUNCIL
PURCHASE OF SITE
FINALISE SITE DEVELOPM'T PROPOSALS

- Environment (refer 2.1.2)
- Location (refer 2.1.3)
- Soils (refer 2.1.4)
- Topography (refer 2.1.5)
- Size and Shape (refer 2.1.6)
- Accessibility (refer 2.1.7)

2.1.1. Selected Safety Factors

Safety pertains not only to risk of accident but also to health issues such as exposure to electromagnetic radiation, chemicals, dust and pollen. Some of the main safety issues are described below:

Proximity to High Voltage Power lines

While the research regarding the effects of electromagnetic fields on humans is increasing, the results so far have been inconclusive. Nevertheless caution is warranted and a conservative approach is generally advised.

The School Facilities Planning Division of the California Department of Education has developed the following guideline:

a. 30m from edge of easement for 100-110 kV line

b. 45m from edge of easement for a 220-230 kV line

c 75m from edge of easement for a 345 kV line.

The widths of easements will vary from one administration to another - the above information is provided as a rough guide.

Another potential hazard is the electromagnetic fields from high tension cables. Both in Australia and overseas, the permitted levels of electromagnetic fields are being reduced. Confirm if possible current standards as to permitted levels of electromagnetic radiation measured in milli gausse.

Hazardous or toxic substances

Sites with potential exposure to hazardous substances should be avoided:

- Landfill sites where hazardous substances may have been buried
- Sites downwind of stockpiles of fertiliser, soil processing or sewage treatment facility
- Sites in proximity to uncontrolled, pollen producing plants and shrubs

Other safety factors

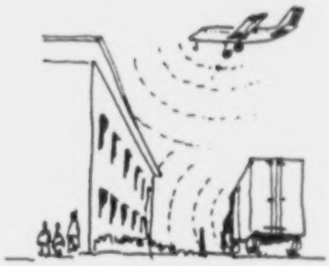
Sites in areas of potential danger to students should be avoided:

- adjacent to highways, airports or heliports
- subject to flooding
- near areas with high incidences of crime or alcohol and/or drug abuse.

2.1.2. Environmental factors

Consider environmental factors, such as noise and air pollution:

- noise sources, such as highways or flight paths where there is no sound buffer, may impede the instructional process
- air pollution, smoke, dust, odours

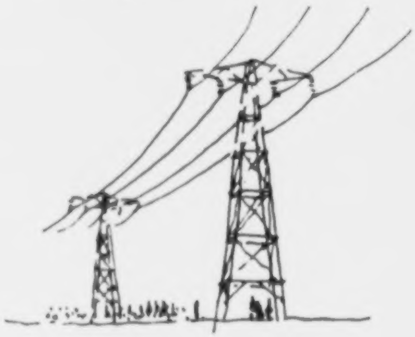


NOISE FACTORS

2.1.3. Location factors

Consider location factors such as convenience for students, proximity to student resources, and zoning:

- reasonable proximity to homes of students (the drawing area)–within half an hour for junior grades and one hour for secondary students
- compatibility with current and future zoning regulations
- proximity to public services such as libraries, parks and museums
- favourable orientation to wind and natural light



ELECTROMAGNETIC RADIATION

2.1.4. Soils

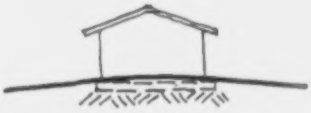
Geological surveys should be carried out to assist in assessing possible sites.

- Avoid fault lines
- Check stability of soil and bearing capacity
- Water-table, with the potential for soil liquefaction if potential exists with soil type

2.1.5. Topography

Topography is the shape and texture of the surface of the ground. A careful analysis will help to avoid the following problems:

- surface and sub-surface drainage
- rock ledges and outcrops, which may be an attractive feature, but also an indication of foundation problems
- Steep grades which would impede convenient access, particularly for less physically able students

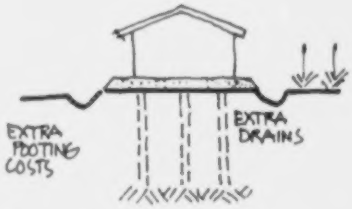


GOOD BEARING

2.1.6. Size and shape

Sites appropriate in size and shape should be chosen:

- area should be consistent with Commonwealth guidelines - refer 2.1.8
- consider appropriate length-to-width ratio (long, narrow sites make planning difficult, particularly if major axis is north-south)
- ensure there is a convenient, large, open space for playing fields
- allow for potential for expansion of buildings and/or site



POOR BEARING

2.1.7. Accessibility

Allow for reasonable accessibility for students, parents, staff and services:

- reasonable road access for buses, for transportation to and from school
- access, parking and loading areas for cars and trucks.

These matters will be dealt with in more detail below.

2.1.8. Commonwealth Government Guidelines to site size

These are to be found in the Commonwealth Program for Schools published each year by the Department of Employment, Education and Training.

It should be noted that these are indicative only, they are not compulsory. Many schools manage well on smaller sites, especially in the cities. (Refer information in box opposite)

COMMONWEALTH
GUIDELINES . SITE SIZE

a. PRIMARY SCHOOLS

- UP TO 100 STUDENTS	1.5ha
- 100 to 200	2.4ha
- 200 +	0.2ha/100

b. SECONDARY SCHOOLS

- UP TO 100 STUDENTS	3.0ha
- 101 TO 200	4.0ha
- 200 +	0.4ha/100

2.2. Local authorities/municipal utilities

There are a several layers of government controls that regulate school developments. The first step is to make contact with the local city, municipal or shire council. If there are other bodies involved the local council will soon advise.

Local government requirements

The local council may impose requirements on schools in respect of:

- noise
- drainage
- materials
- landscape
- parking
- site cover
- distance from boundaries
- disposal of waste water (sewage)
- power cables to be underground
- road upgrades
- traffic calming, signals, roundabouts

Requirements will vary from site to site and should be checked with the local council before finalising the selection of a site.

Local government regulates zoning, water and power, demountable buildings and has its own planning proposals. School planners should liaise with local government at an early stage to ensure that the school project is coordinated with and can benefit from any local or state plans.

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2.2.1. Zoning controls - need for consultation with local authorities

Municipalities are generally divided up into zones with various allowable uses. This limits the potential of hazardous activities affecting dwellings and similar sensitive areas. Zonings refer to the allowable uses of the land within that particular zone. Two kinds of schedules usually appear: uses which are permitted and uses which are not permitted.

In the case of schools, where they are permitted this will usually be only with Development Consent of the local council. This is a formal and often lengthy procedure.

In the case of schools, a site may be specifically zoned for educational purposes. This is usually the case in respect of government schools. Zoning issues should be addressed and resolved at an early stage of planning, preferably before purchase.

2.2.2. The Environment and Protection Orders

Conservation of the environment has become a significant planning issue for any development. Relevant information is contained in the environment plans developed by the local council. Before selecting a site, planners should be aware of any protection orders and their implications.

Heritage orders

Heritage orders are legal instruments designed to protect local historic sites. They may apply to buildings, farm buildings and the land itself, which may have been used by a person of note.

Aboriginal sites

Sites deemed important to Australian Aboriginal people are likely to be already noted by community groups. They are important in Australia's heritage and need to be handled sensitively and in consultation with relevant groups and local communities.

These matters must be clarified and resolved as early as possible, and well before a site selection is made.

2.2.3. Service suppliers

Further details regarding services for school buildings and grounds can be found in sections 3.8 and 5.3. Some of the more critical aspects are found below:

Water and sewerage facilities

The applicant must usually demonstrate to the local authority that an adequate supply of potable water is available before a school building is approved. Arid regions require planners to pay particular attention to water retention for domestic use as well as for irrigation. Examine rainfall data to determine if adequate water is to be available for the needs of the school if town water is not available.

The school must also have provision for a sewerage system, such as:

- connection to a town sewer
- provision of an on-site sewage processing plant with sufficient capacity. For more detail regarding water and sewerage systems, refer to sections 3.8.2 and 5.3.2.

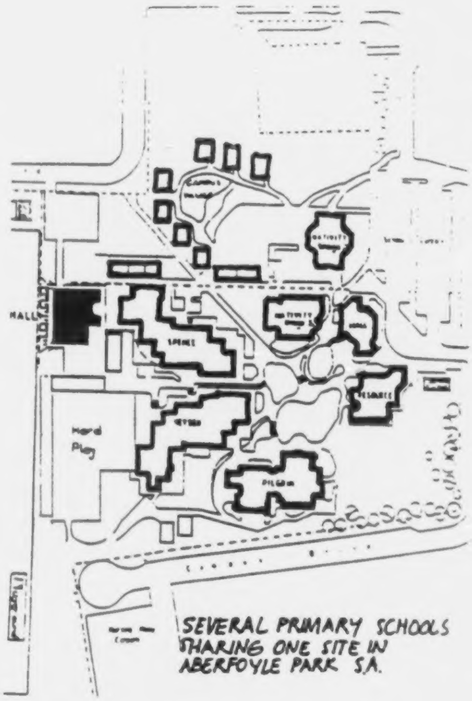
Light and Power

At a very early stage of site selection, the local power authority should be contacted to assess whether adequate power can be supplied. Do not assume that power cables in the street means that there is adequate power supply. Bringing new cables of adequate size to the school site can be very expensive and would be a major cost consideration in choosing a site. The school should plan for growth in power demands, as the requirement for additional electrical energy increases with each subsequent generation. For more information on light and power, refer to sections 3.8.3 and 5.3.1.

Gas service availability, piped or bottled

The presence of natural gas or coal gas services in the street can be a valuable energy resource.

The availability should be assessed. Bottled gas can also be a useful resource but it involves substantial investment in infrastructure. The feasibility should be tested over the period of the life of the school or the life of the infrastructure to determine the benefit of adding a second energy source.



SEVERAL PRIMARY SCHOOLS SHARING ONE SITE IN ABERFOYLE PARK S.A.

2.2.4. State Government Planning proposals

State governments, at times, develop planning schemes in consultation with local councils to maximise the benefit of related infrastructure such as: community transport facility, parking areas, community halls and recreational facilities.

Prior to settling on any site the school planning team should investigate with the local council whether any planning proposals exist. The school should offer to assist and cooperate in any developments being planned as they can be of benefit to the school.

An example of cooperation between a group of schools and the local council and State Government exists in Adelaide SA in an outer suburb called Aberfoyle Park. Here four primary schools operate on one site, two state schools, one Roman Catholic school and one Uniting Church school[1]. The schools share a library, recreational facilities a hall and a Gymnasium, as well as some administration and specialised teaching; music sportand LOTE (Spanish and Mandarin).

2.2.5. Demountables policy

Some councils have resisted the use of demountables or relocatables because of the tendency of schools to require them longer than

---

[1] *Pilgrim School, Aberfoyle Park SA*

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originally intended. The temporary appearance is considered by some councils to be detrimental to the community. Not all relocatables need to appear temporary – the construction is often equivalent in strength and durability to permanent facilities.

If a school plans to start with demountable or relocatable buildings, local planning authority policy must be ascertained at an early stage in the site selection/design process.

In NSW, for example, a number of councils do not require development approval for demountable buildings, only a building approval. Knowing this policy at an early stage, a school can avoid complications and costly delays.

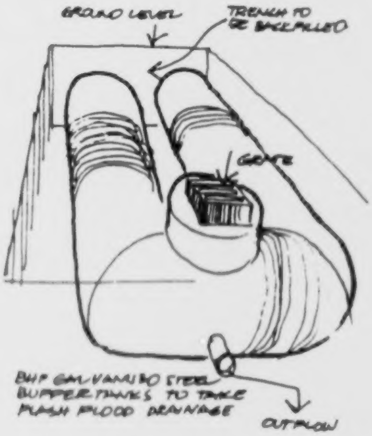
2.3. Environmental Considerations

2.3.1. Selecting sites with respect to sun, wind and rain

Sites subject to extremes in weather conditions should be avoided unless the school design plan includes a way to overcome the problem.

Children need shelter from rain and overexposure to cold, hot winds and sun. Shelter is best provided by natural means such as belts of trees or hills to divert winds. Shelter can also be incorporated in the design by orienting the buildings to provide external access protected from driving rain and wind.

Buildings should also be oriented to take advantage of natural light and warmth.


GROUND LEVEL
TRENCH TO BE BACKFILLED
GRATE
BHP GALVANISED STEEL BUFFER TANKS TO TAKE FLASH FLOOD DRAINAGE
OUTFLOW

2.3.2. Site Drainage

Any potential school site must have the capacity to dispose efficiently of both storm and waste water.

Sites in areas of heavy or sustained rainfall need to be able to dispose of the water quickly without danger to students and without the ground becoming boggy and incapable of use.

2.3.3. Erosion control

Steep sites will require erosion control of the soil by planting. Temporary protection will also be needed using, for instance, biodegradable fabric or earth banks.

In the development phases of a site, the local council will generally require temporary "berms" or banks to contain soil freshly excavated. This is sometimes done using bales of straw pinned to the ground with steel spikes.

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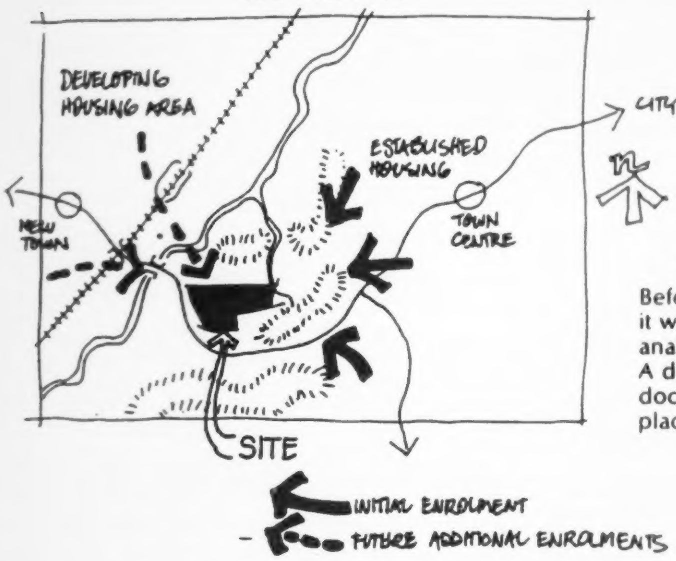
LOCATION MAP

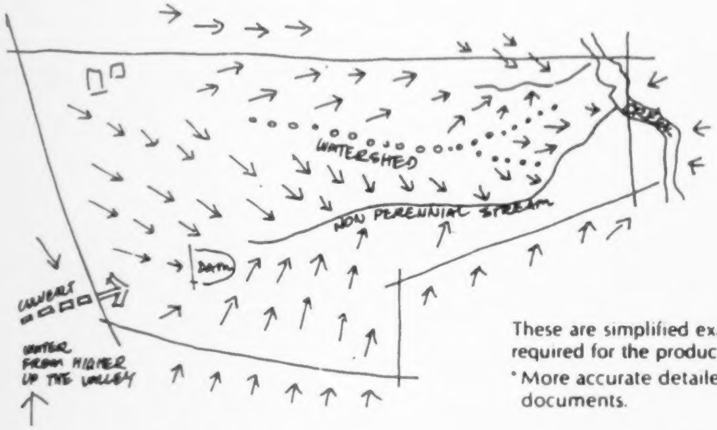

DEVELOPING HOUSING AREA
ESTABLISHED HOUSING
CITY
N
NEW TOWN
TOWN CENTRE
SITE
INITIAL ENROLMENT
FUTURE ADDITIONAL ENROLMENTS

This shows the site relative to transport system and population areas both present and future.

SITE ANALYSIS

Before starting on design work or master planning it will be necessary to make a comprehensive analysis of the major features of the selected site. A detailed professional survey is necessary before documentation and accurate costing can take place.

SITE DRAINAGE PATTERNS

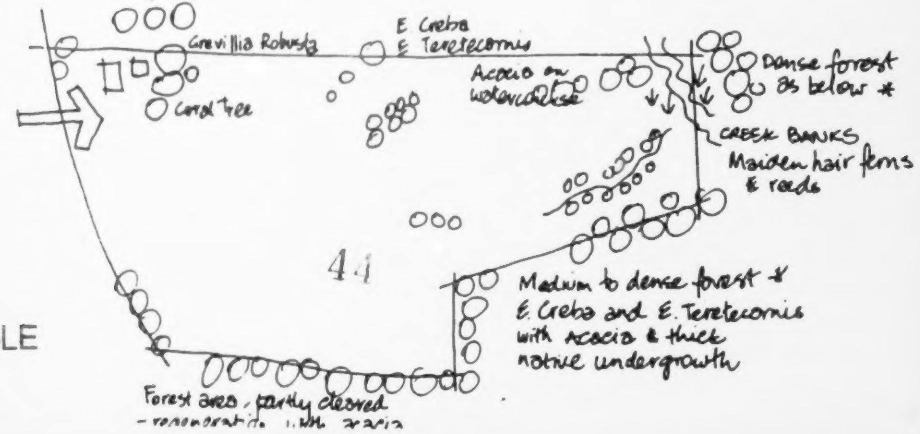

WATERSHED
NON PERENNIAL STREAM
DAM
CULVERTS
WATER FROM HIGHER UP THE VALLEY

*Other data needed includes
- soil bearing capacity
- strata/faultlines etc.
- water tables
- access for services or position of easements
- road access possibilities

These are simplified examples of some of the types of drawings that are required for the production of a site master plan.

*More accurate detailed data is required for the production of working documents.

SITE VEGETATION ANALYSIS


Eucalyptus Creba
Grevillia Robusta
E. Creba
E. Teretecornis
Coral tree
Acacia on watercourse
Dense forest as below *
CREEK BANKS
Maiden hair ferns & reeds
Medium to dense forest *
E. Creba and E. Teretecornis
with acacia & thick
native undergrowth
Forest area, partly cleared
- regeneration with acacia

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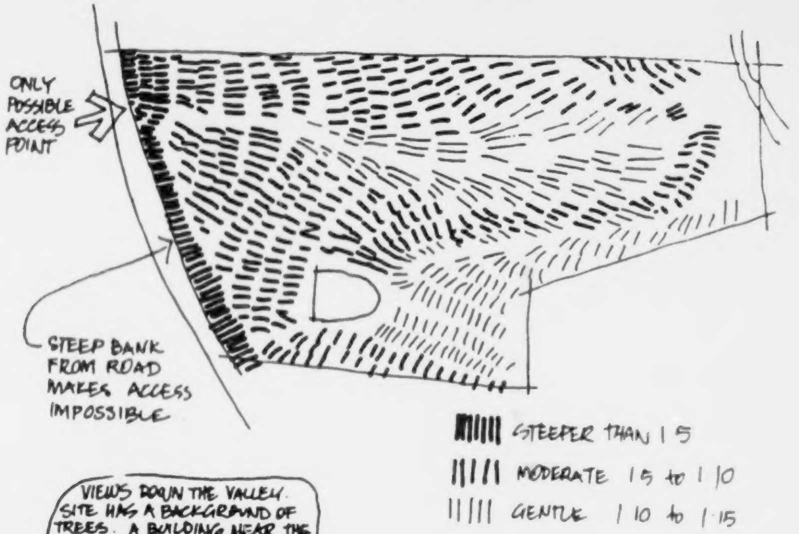
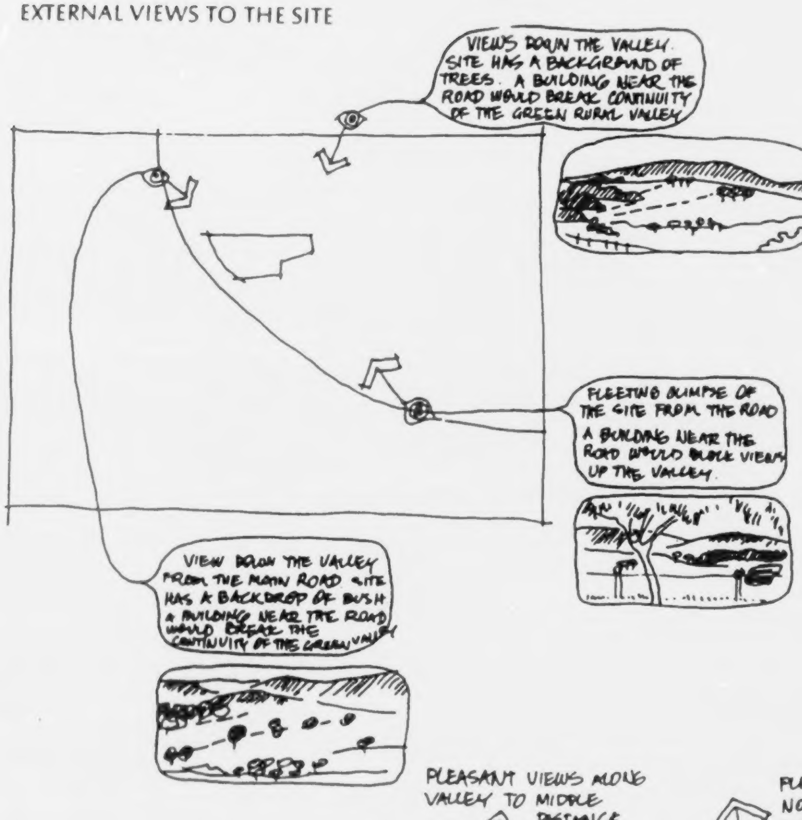
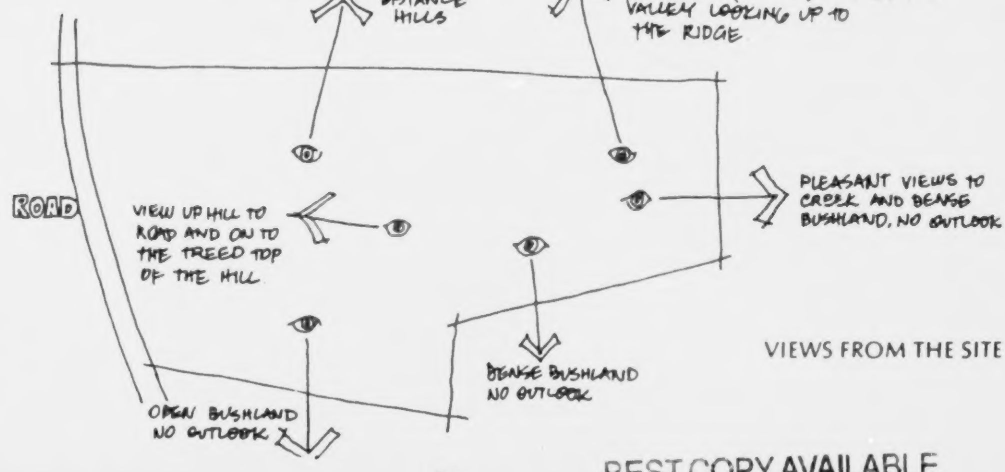
SLOPE ANALYSIS


ONLY POSSIBLE ACCESS POINT
STEEP BANK FROM ROAD MAKES ACCESS IMPOSSIBLE
STEEPER THAN 1:5
MODERATE 1:5 to 1:10
GENTLE 1:10 to 1:15

EXTERNAL VIEWS TO THE SITE


VIEWS DOWN THE VALLEY. SITE HAS A BACKGROUND OF TREES. A BUILDING NEAR THE ROAD WOULD BREAK CONTINUITY OF THE GREEN RURAL VALLEY
FLEETING GLIMPSE OF THE SITE FROM THE ROAD
A BUILDING NEAR THE ROAD WOULD BLOCK VIEWS UP THE VALLEY.
VIEW DOWN THE VALLEY FROM THE MAIN ROAD SITE HAS A BACKDROP OF BUSH A BUILDING NEAR THE ROAD WOULD BREAK THE CONTINUITY OF THE GREEN VALLEY

VIEWS FROM THE SITE


PLEASANT VIEWS ALONG VALLEY TO MIDDLE DISTANCE HILLS
PLEASANT VIEWS OF THE NORTHERN (SUNLIT) SITE OF THE VALLEY LOOKING UP TO THE RIDGE
ROAD
VIEW UP HILL TO ROAD AND ON TO THE TREED TOP OF THE HILL
PLEASANT VIEWS TO CREEK AND DENSE BUSHLAND, NO OUTLOOK
DENSE BUSHLAND NO OUTLOOK
OPEN BUSHLAND NO OUTLOOK

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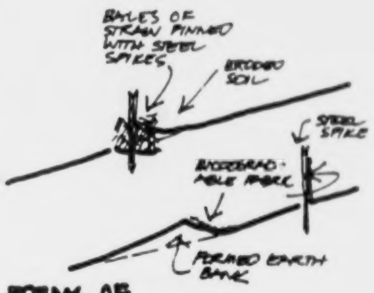

BALES OF STRAW PINNED WITH STEEL SPIKES
ERODED SOIL
STEEL SPIKE
BIODEGRAD-ABLE FABRIC
FORMED EARTH BANK

FORMS OF EROSION CONTROL

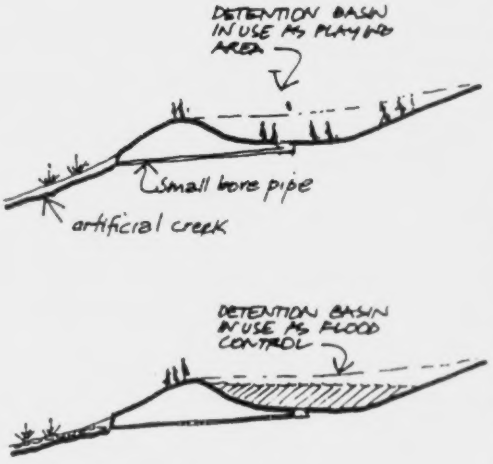
Flash flooding control

The local council will have details of flooding potential and may already have in place a plan for handling large amounts of surface water.

Sometimes detention basins are required. These are depressions in the ground, usually grassed with outlet pipes sufficient only to allow a small quantity of water to discharge at a time. These are, in effect, temporary dams which remain dry for the majority of the time.

These areas can be useful to a school as a playing area. Billanook College in Mooroolbark, an outer suburb of Melbourne has doubled its area by locating the school adjacent to a detention basin. The area is maintained by the school in exchange for the use of the site for playing fields.

Some councils may require a school to discharge storm water to an on-site detention basin.


DETENTION BASIN IN USE AS PLAYING AREA
Small bore pipe
artificial creek
DETENTION BASIN IN USE AS FLOOD CONTROL

FLASH FLOOD CONTROL

2.3.4. Potential for modifying contours

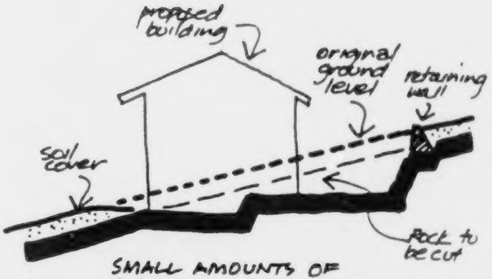
Schools require significant areas of open play space for a wide range of games, even if there is no intention to provide for formal game sites such as for netball and football.

For this reason, a site should have the potential to have the ground contours modified relatively cheaply, if required, by the process known as "cut and fill". Very steep sites do not permit this as retaining walls at the edges become too high.

Rock under surface, soil cover

Sites having excessive amounts of rock near the surface will require expensive excavation for services below the ground. A builder or excavation contractor should be asked to examine the amount of soil cover over rock. This can be done by excavating holes with a back-hoe in areas where the information is critical. This information is required for the following:

- design of foundations
- design of drainage systems
- the extent to which modifying contours is feasible


proposed building
original ground level
retaining wall
soil cover
Rock to be cut

SMALL AMOUNTS OF SOIL COVER OVER ROCK CAN LEAD TO EXCESSIVE COSTS FOR EXCAVATION IN ROCK

Potential for slipping in certain soil conditions

Some sites are not useable because of a tendency for the soil to slip, particularly in wet weather. This condition is usually noted on council planning schemes. Characteristic of such land are sharply undulating and unusual contours.

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2.3.5. Landscaping potential - vegetation

In choosing a site, consider the potential for growing trees. Find out if the site has noxious weeds, hazardous vegetation or plants producing high levels of pollen that will have to be controlled.

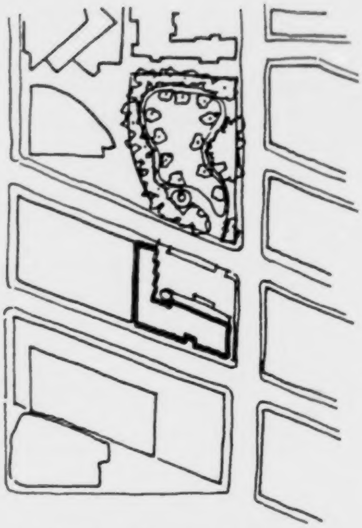
2.3.6. Limited Sites

A large number of new non-government schools commence operations on small or extremely limited sites (inner city or suburban). In these situations, a great deal of care in planning and design is required to provide the necessary buildings and to maximise limited land space for play and recreational purposes.

St Andrews Cathedral School in Sydney is a classic example of such a situation. The school occupies the top two levels of a multi-storey building in the inner city and the roof is a play space. It also occupies three levels of an adjacent building. The students are bussed to playing fields for sport.

Another alternative is to plan the school in a tightly restricted "envelope" where the enclosed spaces are clustered together, maximising the balance of the site for play and recreation.

This is exemplified by the first two stages of Pacific Hills Christian School, Dural, NSW built originally on a 7 acre site (3.13 hectares), part of which was already occupied by a house and a substantial dam which the local council required to be retained. The school at this stage was accommodated in a large single envelope with a gently sloping roof and roof lights to allow light and air into the inner parts of the building.



INNERCITY SCHOOL - WASHINGTON MARKET PARK Serves as extension of school play ground.
NEW YORK CITY
Architects - RICHARD DATTNER
Architectural Record March 1989.

Multiple storeys - advantages and disadvantages

The principle advantage of multiple storeys is to minimise the use of the site allowing maximum play/recreation areas.

The inclusion of an undercroft area for wet and hot weather protection as a play/lunch area and for limited physical education classes should be given careful consideration.

The disadvantages are many:

- high cost
- limitation on flexibility
- difficult to extend/ build as needs grow
- increase complexity in adhering to regulations
- travel between floors/classrooms is time consuming and expensive, particularly if mechanical means of vertical transport is required (lifts)

Usually, two storeys are the maximum desirable and acceptable before additional expense is incurred in complying with fire and safety regulations.

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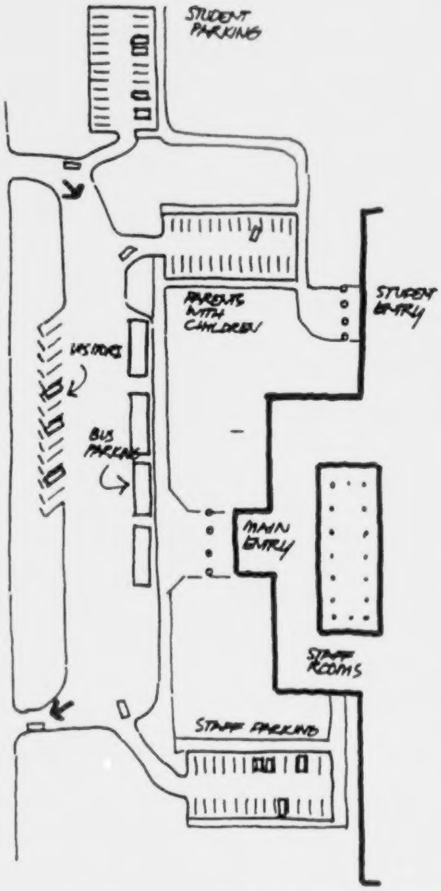


DIAGRAM ILLUSTRATING TRAFFIC·PEOPLE SEPARATION

SCHOOL
40
SCHOOL CROSSING

2.4. Transport considerations

This section covers transportation considerations pertaining to:

- Safety aspects (2.4.1)
- Public transport (2.4.2)
- Private transport, parking and driver training areas (2.4.3)
- Service transport (2.4.4)

2.4.1. Safety Aspects

In selecting a suitable site careful analysis of the safety aspects for children should be made. As much as possible, student transport (particularly for younger students) routes on the school site should be separate from those established for staff, visitors and service vehicles.

Provision should be made for safe loading and unloading of children. Rising car ownership may mean that more children are being brought to school by their parents or are driving themselves to school, thus increasing the potential of serious traffic congestion at drop-off and pick-up times.

If a school is on a busy road there is a variety of traffic management schemes designed to reduce the risk of accident. They include special speed limits or speed reduction devices in the vicinity of the school entrances. Local councils should be approached to introduce such measures.

2.4.2. Public Transport

Proximity to transport routes or the likelihood of these developing once the school is established is an important factor in choosing a site. This should be evaluated prior to purchase. If there is no existing public transport service and none is planned, the alternative is to seek the cooperation of local bus companies in operating buses to the site. This is quite feasible provided the roads will tolerate the traffic. Negotiate as early as possible to determine the potential of such a service.

Bus shelters

Bus shelters are desirable. They can be simply established by attaching a canopy to a building or by covering areas along paths near pick-up points.

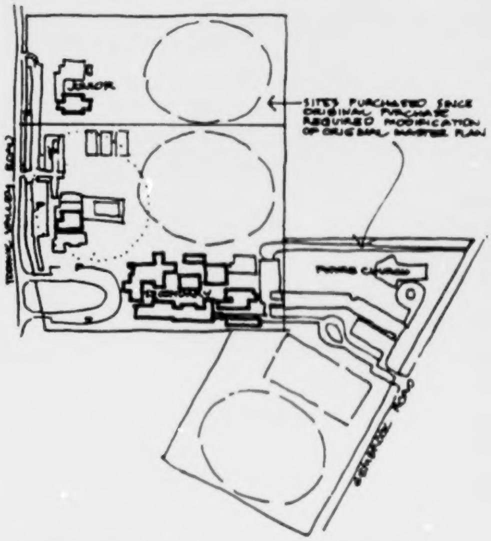
Congested parking areas

Ways of limiting crowding at school bus terminal and carparks include:

- adjusting the school timetable to allow sections of the school to emerge at different times

- having special buses take children to a community bus terminal where they may connect with other buses or meet parents
- the use of one-way traffic flow rules
- the sharing of road and parking facilities with compatible organisations nearby
- provision of drop-off and collection points for use by parents

At Beaconhills Christian College, Packenham Vic., the fortuitous purchase of an adjacent site to the south (for a related church with separate road access) and the expansion to the north for the junior school has provided several areas for car parking which helps to alleviate traffic at peak times.


JUNIOR
SITES PURCHASED SINCE ORIGINAL PURCHASE REQUIRED MODIFICATION OF ORIGINAL MASTER PLAN
FUTURE CHURCH
SECONDARY

BEACONHILLS CHRISTIAN COLLEGE
PACKENHAM, VIC
PETER G LYALL & ASSOCIATES PTY LTD

Council requirements for bus parking/loading/unloading

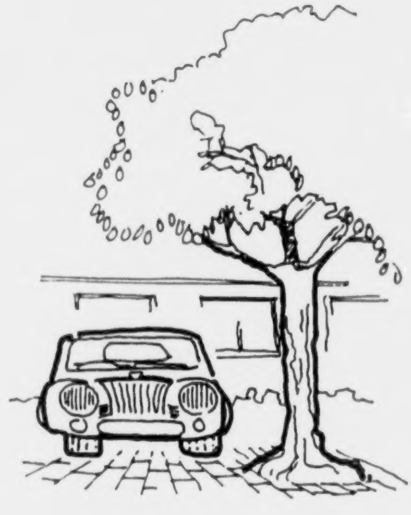
Councils may require quite significant allocation of areas on site to cope with buses. Where the site is limited councils may permit the widening of the roadway adjacent to the school to provide for bus parking. This is appropriate only where there are suitable areas for buses to turn.

2.4.3. Private transport – parking and driver training areas

Staff parking

Adequate staff parking, sealed, preferably shaded and away from drop-off zones, needs to be provided. Unit paving such as brick or concrete pavers should be used if trees in the parking area have vigorous roots which may disturb continuous road paving such as bitumen.

Staff parking should be somewhat remote from the main entrance and isolated from student areas and preferably near the staff entrance.



UNIT PAVING UNDER TREES REDUCES IMPACT OF TREE ROOTS ON PAVING AND ASSIST GROWTH

Visitor parking

This needs to be adjacent to the public entrance, obvious and welcoming. Entrances, car parks and directions to the administration block should be clearly signposted.

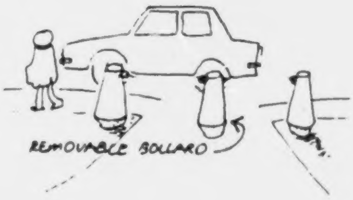
Student parking

Increased senior secondary retention and mature-age students are making increased demands for parking. These areas should be located where they can be supervised and preferably remote from where younger children assemble.

Driver training areas

If a school master plan requires a fairly extensive road system, it could also be used for driver training and road safety education .

Use standard road signs within the site to designate as many of the typical road conditions as possible so that children on bicycles can also be trained in road safety.



REMOVABLE BOLLARD ALLOWS TRAFFIC WHEN REQUIRED .

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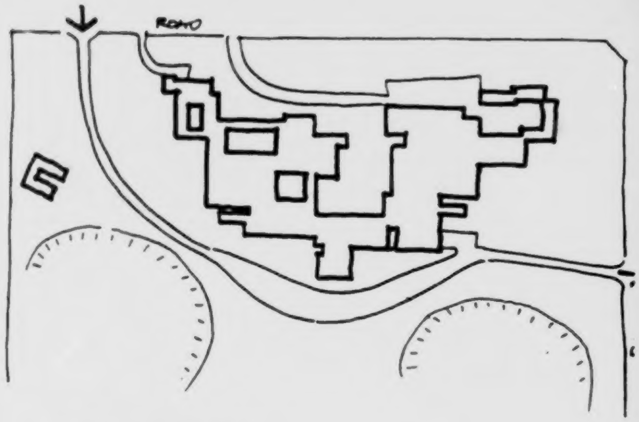
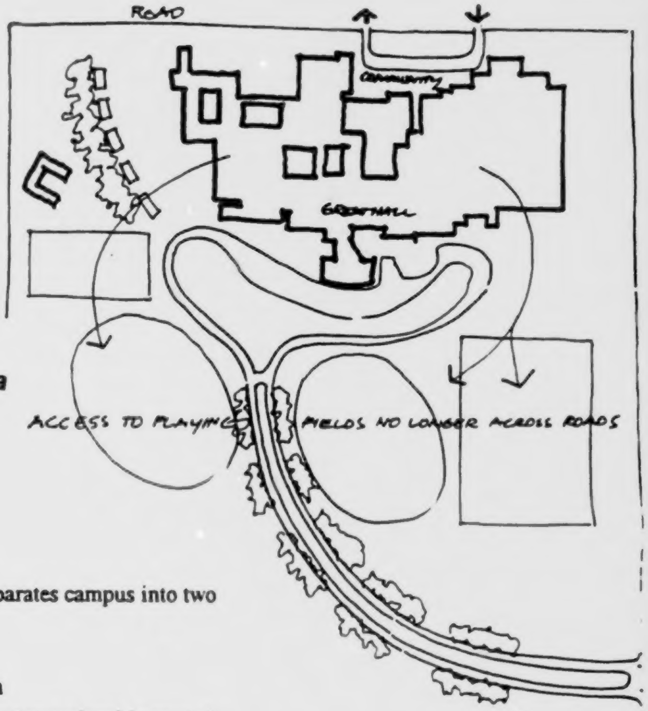


EXISTING SCHOOL



NEW MASTER PLAN

Yarra Valley Anglican School, Victoria

Architects for new Master Plan –

Clarke, Hopkins & Clarke Architects

Existing School:

- prep to yr 10 boys only, yrs 11 and 12 co-ed
- one way road for cars, buses and deliveries separates campus into two halves and creates a safety hazard
- no definition/recognition of student zones
- administration centre is located in remote area
- maintenance facility provides and undesirable strong visual impact at main entry to school

New Master Plan

- fully co-educational school by 2004
- senior and junior playing areas separated
- development of four identifiable zones within the campus, i.e. primary/junior, secondary, senior secondary and community
- access to school via landscaped playing fields and impressive vista of Great Hall from approach road
- administration centre relocated into existing building adjacent to parking area.

2.4.4. Service transport vehicles

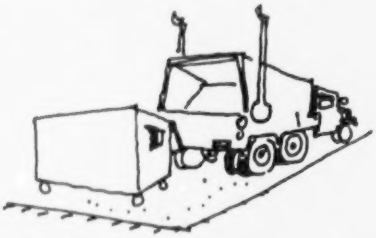
Deliveries

There are several areas where deliveries need to made to a school, among them:

- canteen
- maintenance workshop
- science and technology areas
- administration and staff areas

Roads should be carefully planned in conjunction with the building plans to make service access convenient and, preferably, isolated from areas used by students.

If possible take account of changing levels to provide a dock to make the unloading of trucks into the building more convenient.



ENSURE ROAD PAVEMENT IS ADEQUATE FOR HEAVY WHEEL LOADS.

Refuse disposal

With concern for the environment requiring the sorting of refuse, several vehicles will need access to these areas regularly. Some of these vehicles will be quite large, using mechanical lifting equipment and therefore require plenty of room to manoeuvre.

Emergency - ambulance, rescue and fire

Ambulances and rescue vehicles need ready access to the sick room, to the playing fields and to other areas where accidents are likely to occur, such as technology areas.

Fire trucks need ready access to fire hydrants as well as access to most doors and walls. This need not necessarily be by road, but can be across playing fields provided ground conditions are sufficiently stable and capable of bearing the wheel loads.

In rural environments access to fire trails is desirable through school property and to the perimeter of the property via cleared areas to provide easier access to fires which are threatening the school.

2.5. Recreation facilities

Students need recreation and lunch areas that are shaded and preferably near classrooms to enable effective supervision and use during class time.

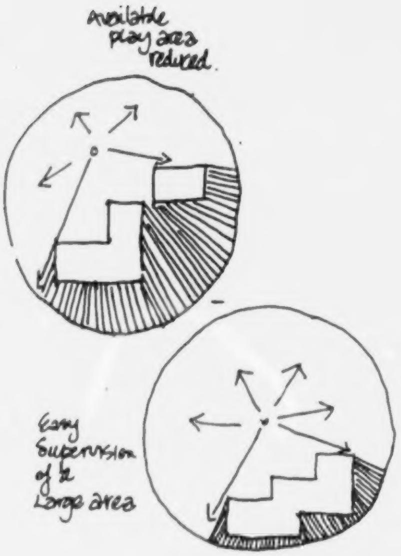
Primary

Primary students require large playgrounds as well as small areas for fixed equipment designed to help them develop muscle coordination.

Secondary

Secondary students need sports grounds (see 2.5.3 below) as well as areas for relaxing and socialising.

Generally, secondary level sporting areas should be quite distinct from primary level areas for safety reasons. Some mixing of senior and junior student areas may be appropriate if compatible with the school's ethos and student preferences.


Available play area reduced.
Easy supervision of a Large area

LOCATION OF ELEMENTS ON A SITE AFFECTS THE AVAILABLE, SUPERVISABLE PLAY AREA.

2.5.1. Passive recreation

Passive recreation areas include:

- intimate courtyards with seating where effective supervision can be maintained
- shaded areas
- gardens with flowers, plants used in biology, and native shrubs to encourage birds
- animal enclosures where agriculture is studied

2.5.2. Active Recreation

Active recreation in schools includes:

- formal games areas, hockey, football, cricket, netball, basketball, tennis courts. Some of these activities can be indoors (multi-purpose hall)
- swimming pools
- large expansive areas for unstructured play
- climbing equipment (moving equipment like roundabouts and swings are usually inappropriate in schools)
- gymnasium
- practice areas for specific sports

2.5.3. After hours use

When choosing a site, the after-hours use of sporting facilities should be a consideration. The use of lighting and the potential impact on neighbours should be considered and planned for in the very early stages.

2.6. Site facilities and services

2.6.1. Paths and roads

As a general principle, the road network should be kept to the perimeter of the school with the footpath system being internal and quite separate from the road network. In certain cases paths may need to follow roads.

The paths should follow logical arrangements – be where people want to and need to walk. If a track across a landscaped area develops, it is a sign that paths have not been well planned. To block access to "tracks" with artificial barriers "misses the point" and creates an unnatural landscape tension.

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A suitable and safe distance must exist between all exits and roadways. Exits which open directly on to roadways are a hazard to both pedestrians and vehicles. Plan to have a length of path between doors and roads.

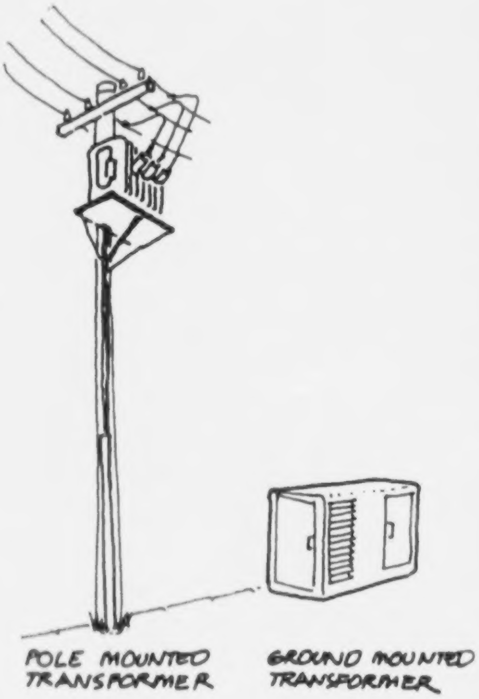
2.6.2. Site Services

Stormwater drainage systems and disposal

The system should be designed with the maximum development potential in mind, to avoid having to replace pipes at a later stage.

Disposal can be:

- on site (if site is large)
- via street drainage system
- adjacent creek/river
- across ground (design to avoid scouring and erosion)
- on site storage – dam, used for irrigation



Power reticulation, substations, emergency access

Design with maximum potential in mind. Locate main supply cables and conduits in readily accessible areas for emergency replacement and access in case of fire.

It is good economic sense to lay additional conduits alongside those required in the first instance to take the additional cables for future developments.

Substations are sometimes required to be located on the school site for which the supply authority will usually require a lease for a nominal amount.

Sewage disposal

The school can dispose of sewage using a municipal or on-site system. For details see section 3.8.2.

Communication systems for support staff

In planning the site services it is important at the earliest possible stage to establish an efficient communication system throughout the school. It will be used initially during the construction of the school and later, for example, to locate support staff in emergencies and for deliveries. The system may comprise:

- induction cable and receiver
- mobile phone
- two-way radio
- pager
- public address system

A public address system, if installed, should be used only for emergencies and other special purposes, as it interferes with classes when used during teaching periods. Furthermore the noise levels generated are often a concern with neighbours. If a public address system is required, plan for it to be directed if possible away from neighbours properties.

Site lighting for security

Plan for a well-lit school site after hours, preferably for the entire night. This will involve reticulating power throughout the site as well as providing adequate lighting controls. Lights activated by movement detectors are useful as they provide light only when needed and thus save power.

Site security

Site security is best provided by:

- a human presence on site – staff accommodation or janitor
- surveillance by security companies
- security patrol – irregular so it can't be anticipated

Consider how surveillance can be readily accomplished by a caretaker, camera or patrol. Minimise areas where intruders can hide, particularly near entrances. Ensure entrances are well lit.

A restriction on vehicles moving into the site after hours provides an effective deterrent to theft, as stolen material must be carried to the perimeter of the site. These measures, however, will not stop vandalism.

Depending on the security levels desired perimeter fences may be either 1.2-metre-high chain wire or in areas of extreme cases of vandalism 1.8 metres high with barbed or sabre wire at the top.

2.6.3. Fire control

In selecting and managing a school site the maintenance of an environment safe from fire is a high priority.

Natural fire breaks

Keep bush clear of buildings by a margin recommended by the local fire brigade. This margin will vary according to the degree of risk and the terrain.

Hydrant systems

Fire hydrants are large stand pipes to which the fire brigade can connect their hoses and/or their own fire pumps in order to provide sufficient water to fight a fire. For more detail refer to section 3.8.6.

Hose reels

Hose reels are fire hoses suitable for use by untrained personnel. Along with fire extinguishers they are the first line of defence. For further detail refer to section 3.8.6.

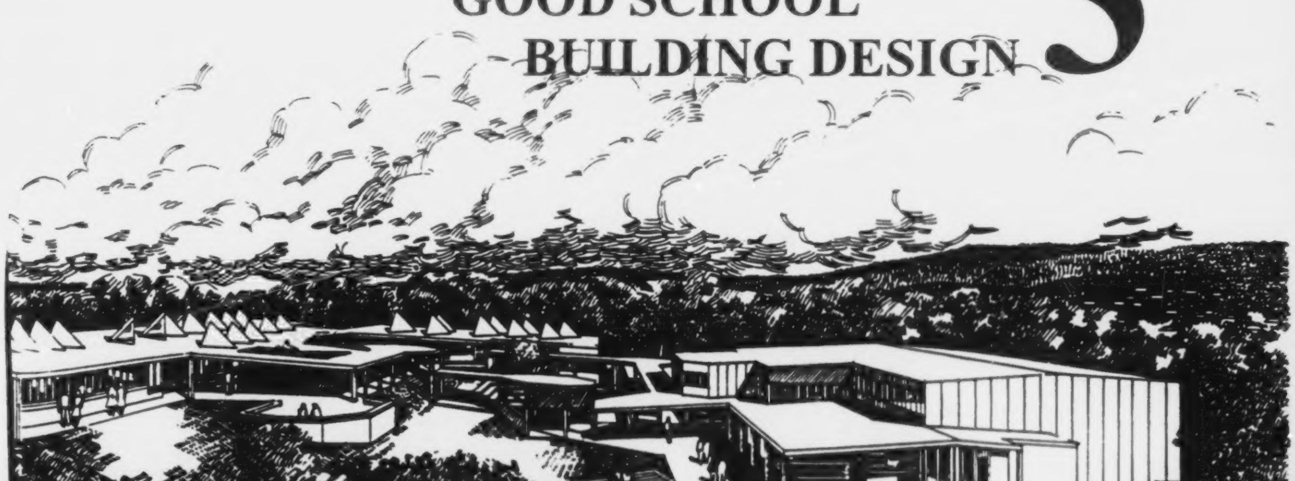
School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

PRINCIPLES OF GOOD SCHOOL BUILDING DESIGN

3



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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1	Introduction and Chapter 1 – Developing a Master Plan
2	Chapter 2 – Making the Most of Your School Site
3	Chapter 3 – Principles of Good School Building Design
4	Chapter 4 – Purpose Designed Facilities
5	Chapter 5 – Construction Methods and Materials
6	Chapter 6 – Managing the Construction Process
7	Chapters 7 and 8 – Technology and Managing Buildings
8	Appendices

ISBN 0 646 23758 6 refers to the complete set of 8 booklets

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Epping NSW, Australia

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

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3

Principles of Good School Building Design

3. Principles of Good School Building Design

The master planning team will set the broad parameters for the design of the school building. The professional consultants, such as architects and engineers, will develop the design in terms of the brief, the environment, legislation and codes.

Although the planning team will not be involved in the detailed design of the buildings, they must be able to participate intelligently in the following design activities:

- supply the necessary information to the designers
- understand the responses of the design team
- evaluate the design presented in the light of the brief.

The aspects of school building design covered in this chapter are:

- fundamentals of good design (3.1)
- designing to accommodate change (3.2)
- issues affecting building arrangement (3.3)
- building arrangement variations (3.4)
- recycled buildings (3.5)
- relocatable buildings (3.6)
- energy considerations (3.7)
- building services (3.8)
- Security, buildings, personnel and property (3.9)

Achieve significant savings by focusing on real needs

3.1. Fundamentals of good design

A common plea is that excellence equates to higher-than-necessary costs. The irony is often the reverse – the "it-will-do" philosophy often leads to greater costs through wastefulness of building area, rooms, and the use of materials which are not quite suitable.

Significant savings can be achieved if careful thought is given to planning at the very early stages, focusing on real needs rather than desires and dreams alone. Major factors to be addressed are as follows:

- The needs of the users (3.1.1)
- The significance of educational decision making (3.1.2)
- Space standards that reflect educational requirements (3.1.3)
- A building designed to last (3.1.4)
- Incorporating flexibility without sacrificing appropriateness (3.1.5.)
- The building as a healthy and safe environment (3.1.6)

3.1.1. The needs of the users expressed in design brief

It is important to prepare a sufficiently precise design brief. The brief is crucial, as it guides the designer regarding space and equipment requirements and their relative priorities. If the design brief is not accurate the outcome will not satisfy the users.

A building exists primarily to achieve an objective. A school building is not an end in itself but a means towards the fulfilment of the needs of the users and decision makers. Hence, a brief should include all legitimate points of view early in the design process. Consequently, the users and their needs and aspirations must be identified. The users are:

- students
- teachers
- parents
- members of the community
- other schools.

A clear statement of agreed priorities formulated at the beginning of the project will minimise further compromises later. Possible conflicts in priorities may include:

- teachers want classrooms - parents want a multi-purpose hall
- students want playing fields - staff want a library
- administrators want classrooms - staff want staff rooms

These are all fundamental requirements of a school, but the order of priority has a definite relationship to its viability and excellence. Classrooms, for example, pertain to short-term financial viability, libraries pertain more to educational excellence. Educational excellence pertains to the long-term viability of the school.

3.1.2. The role of educational decision makers

The design must reflect legitimate local educational decision-making and thinking as well as take into account economic, political and social factors. There are three basic decision-making groups concerned with educational building:

- policy makers at all levels and administrators, both internal and external to the school,
- educational and building professionals and specialists
- staff and users (students and parents).

Each of these groups contributes in different ways to the development of the brief, and each must be successfully integrated into the briefing process.

The politicians and government administrators have an impact on educational building by means of capital funding. Their decisions and policies need to be taken into account in preparing and developing the brief. Likewise the policy makers on the School Council and School administrators.

Education and building professionals and specialists contribute their research on improving environments for education. Those responsible for preparing the brief should ensure that the latest information is being used. Appendix 9.7 lists relevant documents. The OECD documents dealing with the issues of Learning Environment and Technology in Australia (LETA) are of particular relevance.[1] [2]

While current research is important, the staff and other users' (students, parents and community) perception of excellence in education must also be considered. There is little point in following the latest international trends if the local staff and community are more strongly committed to another approach. The perceptions and intentions of the users will greatly affect whether the implemented design will, in fact, "work".

3.1.3. Space standards must reflect educational requirements

Broad space standards (for example, expressed as a number of square metres per pupil) are the most convenient way of ensuring that educational requirements are met. They must be applied, however with due consideration to local conditions and requirements.

Space standards give a rational basis for the allocation of resources and provide a common vocabulary for briefing, design and planning. They need not be expressed in great detail, but can be included as recommendations, allowing for flexibility in their application.

The Commonwealth Government has established eligibility standards for capital grants, referred to as the "area standard" or more commonly the "globals". They represent maximum measures. At the time of writing the standards were as follows:

COMMONWEALTH GOVT.
GLOBAL AREA
CALCULATION

	Nos		m^2		m^2
Primary school	100	x	6.13	=	613
Secondary school	200	x	9.75	=	1950
Total area for	300			=	2563

This is the area of all enclosed spaces together with attached external covered areas ÷ 3.

This limitation applies only if a Commonwealth Capital Grant is being applied for.

---

[1] *New Technology and its impact on Educational Buildings – Organisation for Economic Co-operation and Development Conference Adelaide - 1994*

[2] *Redefining the Place to Learn - Susan Stuebing OECD - PEB, 1994*

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	sq m/pupil
Primary schools	6.13
Secondary schools	9.75
Boarding schools	24.00

This area is exclusive of walls. External covered walkways and areas having a rigid and waterproof cover that are enclosed on up to three sides are included but at one third of the total area.

NSW has an Interest Subsidy scheme that also applies global standards for eligibility, which is discussed in further detail in Appendix 9.9.

In 1980, the Commonwealth Schools Commission published a series of booklets on school planning, among them "Planning School Building Projects".

Incorporated here are some area guidelines for cost study purposes. They are provided here as a rough guide. Current educational thinking may require a modification of the relative sizes of these functional spaces. Indeed NSW, with the recent changes in curriculum, no longer has a subject called "Home Economics".

PRIMARY SCHOOLS

	Area per pupil - sq m	
	min	max
Library Resource area	0.4	0.5
General Learning area	2.6	3.5
Physical Education	0.35	0.45
Administration	0.4	0.7
Pupil Amenities	0.25	0.7
Travel/Engineering	0.6	1.2

SECONDARY SCHOOLS

	min	max
Library Resource area	0.6	0.7
General Learning area	1.7	2.5
Physical Education	0.7	0.9
Administration	0.7	1.0
Student Amenities	0.45	1.0
Travel/Engineering	1.3	2.0
Science	0.65	0.85
Art	0.25	0.45
Industrial Art*	0.6	0.75

Home Economics*	0.35	0.55
Music	0.15	0.25
Tiered Lecture Theatre	0.7	1.0

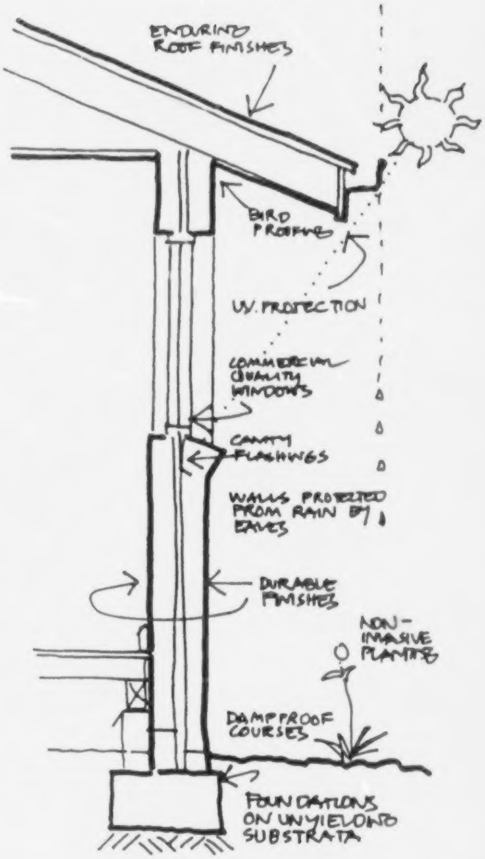
*These are now described as Technology and Applied Studies or abbreviated to TAS.

3.1.4. The building must be built to last

"Durability" and "Flexibility" are not terms in conflict. Durability in this context refers to the external elements such as walls, roofs and floor structure, while flexibility refers to the internal configuration of dividing walls and partitions. Flexibility incorporates the capacity of the internal arrangements of the building to adapt to change.

Factors promoting durability are:

- well-constructed foundations which limit damage due to cracking of walls
- enduring materials which resist decay due to rotting (in the case of natural materials such as timber and canvas, fretting of masonry due to water penetration and freezing in cold climates)
- protection from ultraviolet radiation by means of wide eaves or sun shades
- protection from excessive moisture by eaves
- quality external surface finishes where required. Avoid applying a finish that is less durable than the material to which it is being applied unless a decorative finish is necessary. Rather, choose a base material having acceptable natural colour.
- quality window and door construction designed to resist weather penetration, wind damage, heavy and careless use and wilful damage and abuse



DURABLE EXTERNAL WALLS & ROOFS

3.1.5. Building designed for flexibility without sacrificing appropriateness

A school must be able to cope with short-term changes in group sizes, teaching and learning methods, and educational activities. It should also be able to cope with unforeseen changes required for instruction, new technology or evolving demand. School buildings should be flexible as well as functional. However, flexibility should not overshadow appropriateness. Spaces should be well-defined and suited to their intended use.

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A flexible building will permit variations in its use without requiring significant modification to external walls. Internal walls will be able to be removed and/or relocated without affecting the structure, the roof or external walls, and services such as the power and water distribution systems.

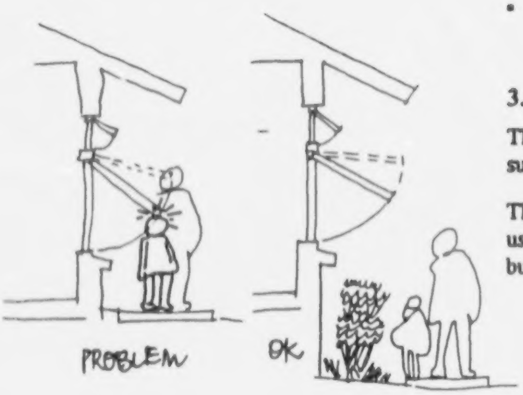
Some examples of where flexibility can be useful:

- General Purpose Learning Areas (GPLA) used initially as Special Purpose Learning Areas (SPLA) for Science and Art until more permanent facilities are available
- GPLA used initially as library or for administration. Equipment can be installed and moved when new facilities are available.
- Science room shared with Art - both require benches, water and drainage facilities. When the school requires science room full time, an Art room can then be provided.
- Open covered area used initially as assembly/multi-purpose hall.

3.1.6. The building as a healthy and safe environment

The building must offer a healthy and safe environment which supports and enhances the teaching and learning environment.

The latest findings on the influences of the indoor environment on users should be incorporated in all new and refurbished school buildings.



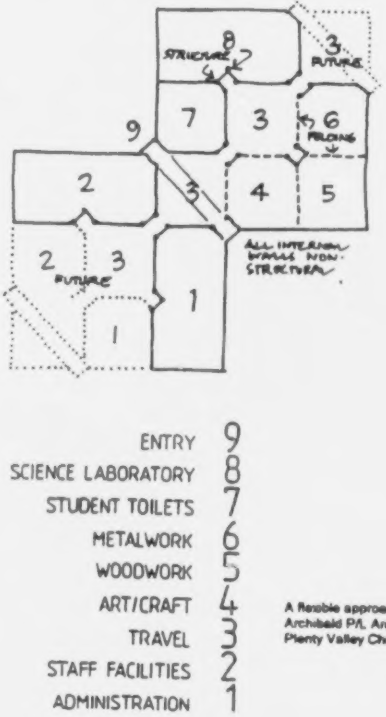
3.2. Designing to accommodate change

Schools must be able to accommodate changing needs, such as in curriculum, enrolment patterns, community and commercial uses. Therefore, the school building should be flexible in layout and structure to allow for these changes.

3.2.1. Changes in curriculum

Schools need to be flexible in layout and structure to accommodate significant changes in curriculum resulting from changing government requirements, developments in educational practice and new technology. Some examples of changes:

- diminishing demand for language laboratories
- greater demand for technology subjects
- changes in teaching of technology
- smaller class rooms for seminar activities
- increased number of subjects being offered
- changes in way subjects being offered such as links with TAFE, use of correspondence or Open Learning facilities



A flexible approach to designing a school devised by Paul Archibald P/L Architects - this principle was applied at Plenty Valley Christian School, Vic

3.2.2. Changes in enrolment patterns

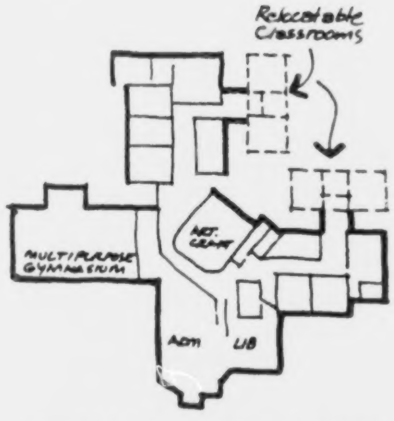
Changes in enrolment, such as an increase in demand for secondary spaces and reduced demand for primary, are not easily catered for unless changes in room sizes, and accessibility to special services and rooms have been allowed for in the initial design. Where such changes can be anticipated, they should be included in the planning process.

If space is provided for the maximum enrolment, there may be significant periods of excess capacity. Therefore, it is in the school's best interest to plan for a combination of flexibility and possible future growth.

Examples of ways changes in needs can be accommodated:

- dual use of rooms, e.g. library in GLA
- plan some of the facilities to be cn the periphery of the school site in buildings designed as dwellings but adapted for school use temporarily. See Aberfoyle Park High School in Adelaide (1984).
- a relocatable classroom attached to the permanent facility. Design the building so that the link space becomes a useable space in the long term when the relocatable room has been removed. Refer Chapter 4 in which a school in Woori Yallock, designed by Clarke, Hopkins and Clarke, is illustrated.
- use classrooms for administration or evening classes

Many creative ideas have been developed that allow for flexibility in school buildings. See sections 3.4 and 3.5 for examples.


Relocatable Classrooms
MULTIPURPOSE GYMNASIUM
ART. CRAFT
ADM
LIB

WOORI YALLOCK PRIMARY SCHOOL
VICTORIA
CLARKE, HOPKINS & CLARKE, ARCHITECTS

3.2.3. Uses other than for education

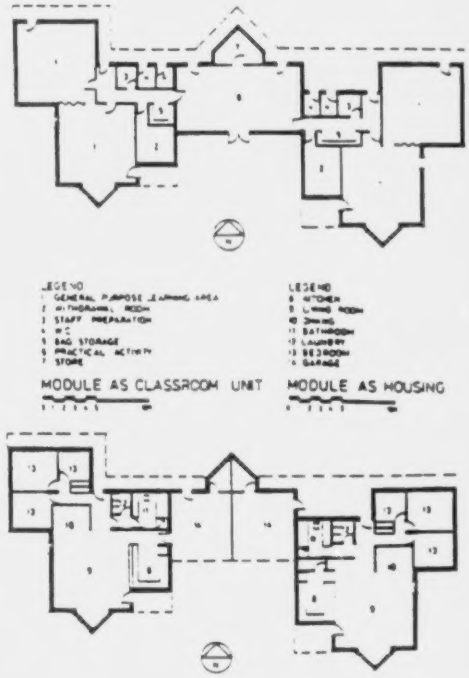
School buildings are very expensive facilities that are often under-utilised. Increasingly schools are beginning to open their facilities to community use, usually on a commercial basis. For example an increasing number of schools are running adult education classes in the evenings.

School facilities that can also be used by the community include:

- gymnasium
- multi-purpose hall
- kitchens - food science areas
- technology rooms
- computer rooms

When designing the school, allowance should be made for these spaces to be used after hours. Consideration needs to be given to: access, parking arrangements, security on a separate circuit, capacity to lock-off areas from public access after hours use, external lighting, access to telephones and toilets.

Part or all of the school may be planned for an eventual conversion to a tertiary facility or other use. A number of schools in Adelaide are planned in buildings designed eventually to revert to houses. [1]


LEGEND
1 GENERAL PURPOSE LEARNING AREA
2 WITHDRAWAL ROOM
3 STAFF PREPARATION
4 WC
5 BAG STORAGE
6 PRACTICAL ACTIVITY
7 STORE
LEGEND
8 KITCHEN
9 LIVING ROOM
10 DINING
11 BATHROOM
12 LAUNDRY
13 BEDROOM
14 GARAGE
MODULE AS CLASSROOM UNIT
MODULE AS HOUSING

---

[1] *PEB Exchange October 1992 (OECD Publication)*

TYPICAL WORKSHEET FOR FORECASTING ROOM REQUIREMENTS

	'93			'94			'95			'96		
Grade	Class	Nos	Total	Class	Nos	Total	Class	Nos	Total	Class	Nos	Total
Kinder	2	25	50	2	25	50	2	25	50	2	25	50
1	2	30	60	2	30	60	2	30	60	2	25	50
2	2	30	60	2	30	60	2	30	60	2	30	60
3	1	30	30	1	30	30	2	30	60	2	30	60
4	1	30	30	1	30	30	1	30	30	2	30	60
5	1	30	30	1	30	30	1	30	30	1	30	30
6	1	30	30	1	30	30	1	30	30	1	30	30
7	2	32	64	2	32	64	1	32	32	1	30	30
8	2	32	64	2	32	64	2	32	64	1	30	30
9	1	32	32	2	32	64	2	32	64	2	32	64
10	1	32	32	1	32	32	2	32	64	2	32	64
11	1	25	25	1	30	30	1	32	32	2	25	50
12	1	20	20	1	24	24	1	28	28	1	30	30
Prim	9		290	10		290	11		320	12		340
Sec	8		237	9		278	9		284	9		268
total			527			568			604			608

Anticipated Room Requirements in 1996

From the above tabulated forecast figures of enrolment the following calculations can be made. The formulae are similar to those used in assessing room requirements by Block Grant Authorities.

Primary 12 classrooms (1 per class)

Secondary 9 x 1.4 = 12.7 say 13

(The formula anticipates about 70% usage – 1.4 approximates the inverse of 0.7)

Of these GPLA (9 x 0.7) = 7

SPLA (Special purpose rooms) 6

3.3. Issues affecting building arrangement

The school structure, the terrain, the climate, security and consideration for the disabled will affect the building arrangement. This section will cover various building arrangements to accommodate these factors.

3.3.1. The school structure

There are various ways a school can be organised or structured and the school should have made a decision concerning this at the outset of planning. Some of the alternatives are:

Age or grade groupings

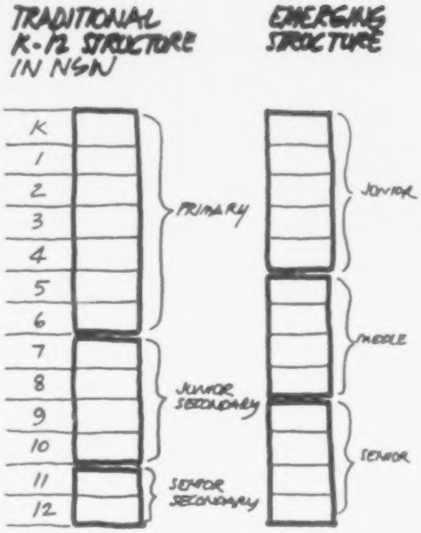
Infants, Primary, Secondary

This is the traditional grouping.

Junior, Middle, Senior

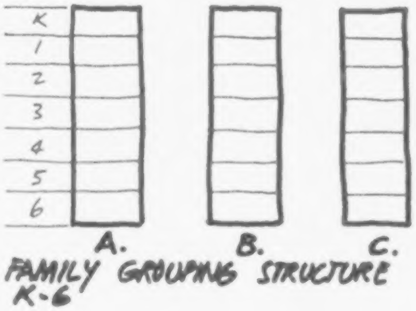
This in an emerging pattern where the changes from primary to secondary are made less dramatic for children. Whereas in primary the children spend most of their time with one teacher and in secondary with a variety of teachers, in "Middle School" there is a compromise. In planning for such a structure the following issues need to be addressed:

- access to special learning areas like science
- classroom size (or an increase or decrease in the number of students per class, as younger children need more space than secondary students)
- arrangement of staff rooms
- toilet accommodation to separate very young children from older children



Family groupings

This form of school arrangement, though not common involves classes of mixed grades, where students in each class may range from Kinder to Year 6. Such will be more relevant in a small school, but may be deliberately chosen for educational reasons. The planning implications are minimal, more related to furniture sizes.



Subject diversity

This is more relevant in secondary than in primary school. Where, apart from basic or core curriculum a group of students pursue a particular course of study, for example Humanities, Sciences, Languages, Human Society, Physical Education. Where this concept applies classrooms may be established in such an arrangement to suit the particular course or range of courses. The benefits include reducing time for travel between classes and movement of resources for teaching. Displays relevant to the course are more accessible and related.

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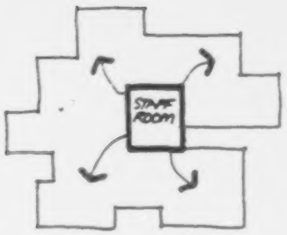
Staffing arrangement

School design will be influenced considerably by the educational staff. Thus, it is important to have the senior educational staff involved in the planning team at the earliest possible stage. There are various ways a school staff may be accommodated.



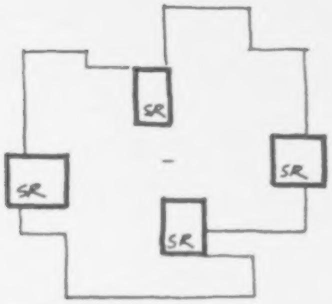
CENTRALISED STAFF ROOM

- **Centralised**

All staff accommodated together in one staff room or adjacent rooms for staff studies, common room and amenities

Advantages: Communication, staff morale, efficiency in space allocation

Disadvantages: Remoteness from some class areas, travel distance for staff to classes, subject preparation in specialised areas, supervision in breaks



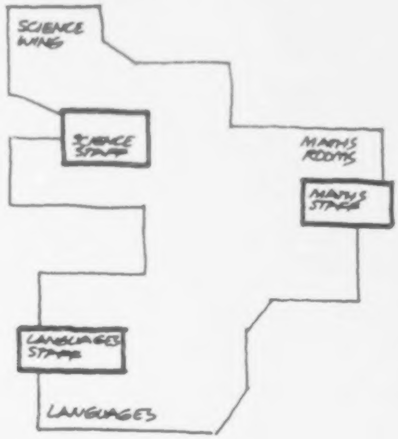
DISPERSED STAFF ROOMS

- **Dispersed**

Staff dispersed around the campus in small studies close to class rooms.

Advantages: Time saved in getting to classes and carrying teaching aids, close proximity to students for maintaining discipline.

Disadvantages: Decrease in communication among staff.



SUBJECT GROUPED STAFF ROOMS

- **Grouped according to Subject**

Staff located together according to subject emphasis.

Advantages: Time saved in getting to classes and carrying teaching aids provided classrooms are similarly grouped; proximity to staff for sharing concerns and problems.

Disadvantages: Decrease in communication among staff members across subjects.

Timetabling - expanding the day, reducing space needs

Because of increasing constraints on capital resources, some schools are seeking ways to stretch limited funds. Two strategies are described below:

- operate, in effect, two schools on the same site, with one group of students attending a morning session and the second group attending an afternoon session, with some overlap. Having two overlapping timetables has significant planning implications. Staff rooms will have to provide for increased staff storage as well as desk space. The cost will be offset considerably by much more efficient use of class facilities, particularly specialised ones such as science and technology where the set-up and equipment cost is high. Another advantage of the split timetable is that students are given wider options.
- operate two schools on adjacent sites, sharing facilities. Trinity College, Gawler SA operates two schools in this fashion. Senior secondary facilities are, to some extent, shared by both schools thus maximising the use of the specialist facilities. Each school has a timetable of six 50 minute periods, one school's program commencing earlier than the other. There is

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an "alignment" of most periods allowing provision and sharing of facilities by both schools.

- Rotating timetable. A theoretical study outlined in "Time for Change" [1], demonstrates that by extending the school day an hour for every three classes, space needs will be reduced to two rooms. Planning considerations are minimal, except that the number of rooms required can be reduced significantly. Minor issues have to be addressed, such as signs at the gate to indicate timetable "day". The rotating timetable is illustrated in the sample day program shown here.

FOR EACH 3 CLASSES. 3 CLASSROOMS ARE REQUIRED

ALL CLASSES	
0850	1
0940	2
1030	3
1120	4
1210	BREAK
1340	5
1430	6
1520	END OF DAY

FOR EACH 3 CLASSES 2 CLASSROOMS ARE REQUIRED

STAGGERED DAY			
	A	B	C
0830	1	1	
0920	2	BREAK	1
1010	BREAK	2	2
1100	3	3	BREAK
1150	4	BREAK	3
1240	BREAK	4	4
1330	5	5	BREAK
1420	6	BREAK	5
1510	END OF DAY	6	6
1600		END OF DAY	END OF DAY

Other ways of maximising the use of school spaces:

- evening, weekend or holiday use
- double-shift work
- multi-track year round - several "schools" in effect operation on the one site each operating for different periods of the year - no holidays for the school building

1.3.2. The terrain

The degree of slope, undulation, aspect of slope, relation to prevailing winds – all have planning implications for the arrangement of the building . It is wise for Master Planning Teams to have the advice of specialist building designers at the time of choosing a site if possible. Not all the planning implications of the terrain are obvious. Section 2 of this Guide Document deals specifically with site considerations. This section deals more with planning issues.

All Saints, Mudgereeba Qld is an example of the use of a comparatively small segment of the total parcel of land, the only portion suitable for building being used very creatively. Refer also to Section 3.4.6.

A steeply sloping site

Some of the benefits of a sloping site for buildings are greater exposure to prevailing cooling breezes, to winter sun and to views in scenic areas. A sloping site allows interesting and useful spaces to be created between buildings, for example amphitheatres.

Some aspects requiring careful attention are:

- surface drainage in areas for pedestrian traffic near the bottom of hills
- access to sewerage from buildings requiring sewerage drainage
- reasonable slope on access pathways - max 1:8 (1:10 for wheelchairs)

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[1] *Time for Change - Conclusions of a seminar in Ouranoupole, Greece October 1987*

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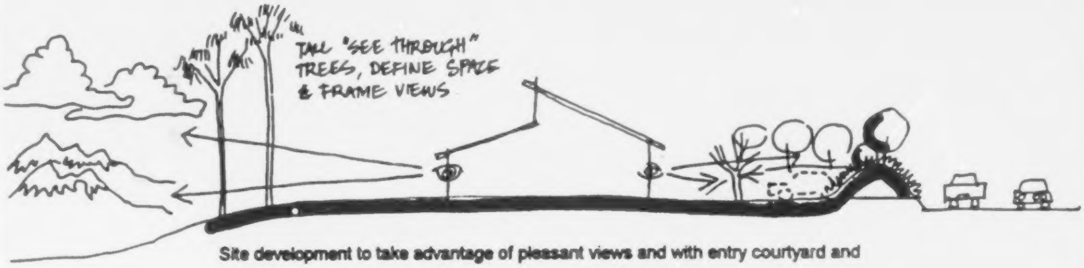
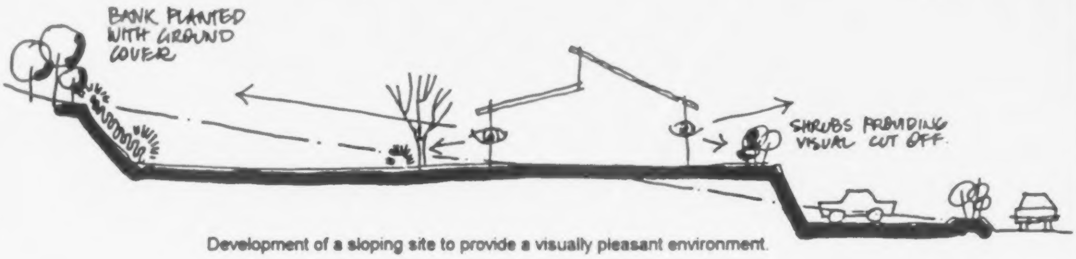
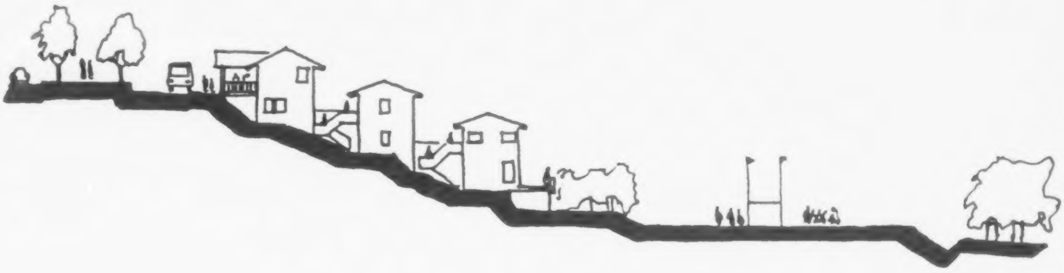

TALL "SEE THROUGH" TREES, DEFINE SPACE & FRAME VIEWS

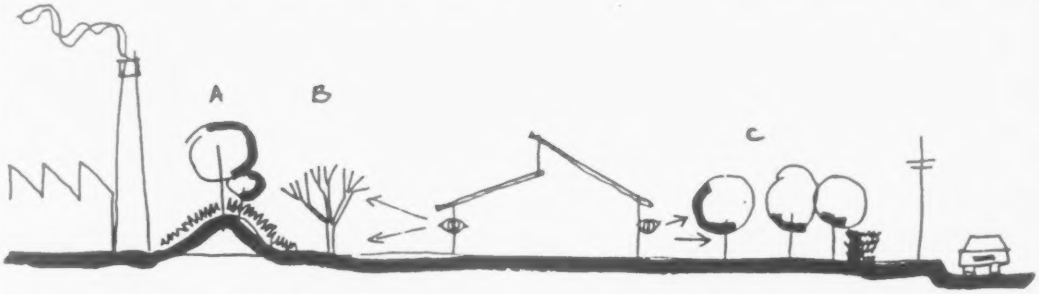
Site development to take advantage of pleasant views and with entry courtyard and mounded screening to visually distracting road and car parking.


BANK PLANTED WITH GROUND COVER
SHRUBS PROVIDING VISUAL CUT OFF

Development of a sloping site to provide a visually pleasant environment.



Even very steep sites can be used with creativity and care, provided access to services and vehicles for construction permit.



A school with visual problems which will cause distractions and identity problems.

Some ways of improving the school by site development:

A mound with ground cover and trees at boundary
B deciduous trees near windows
C entry courtyard and screening plants

Most of the above sketches are from "Schools, Design and Use" Commonwealth Schools Commission 1982

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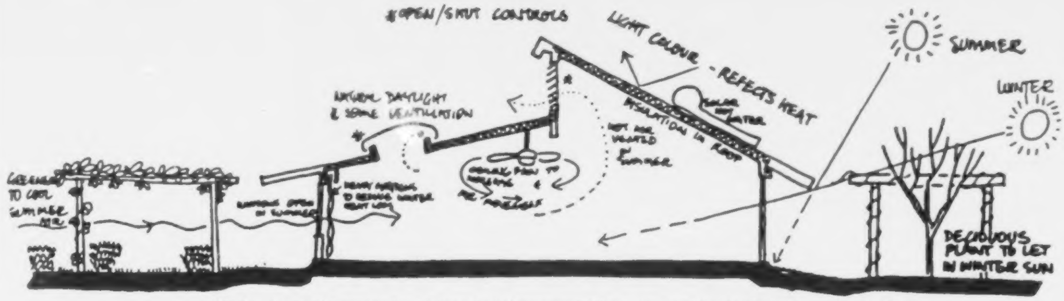
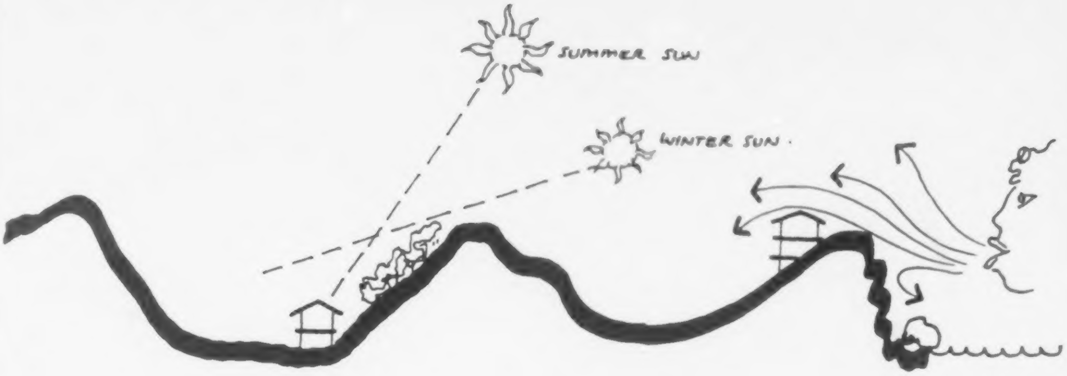
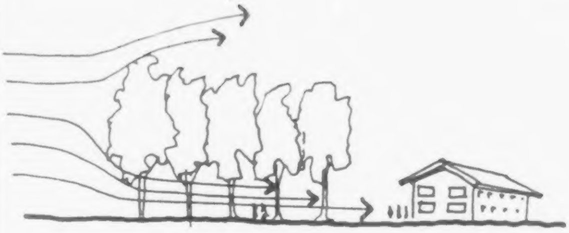

*OPEN/SHUT CONTROLS
LIGHT COLOUR - REFECTS HEAT
SUMMER
WINTER
NATURAL DAYLIGHT & SOME VENTILATION
INSULATION IN ROOF
SOLAR HOT WATER
HOT AIR VENTED IN SUMMER
GREENERY TO COOL SUMMER AIR
WINDOWS OPEN IN SUMMER
HEAVY CURTAINS TO REDUCE WINTER HEAT LOSS
DECIDUOUS PLANT TO LET IN WINTER SUN

Various ways to promote cooling, to induce ventilation , to provide shade in Summer and warmth from the sun in Winter.

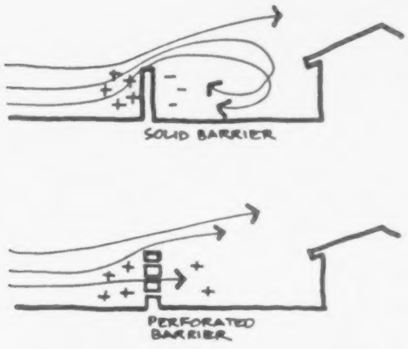

SUMMER SUN
WINTER SUN.

Avoid the lee side of hills if there is need for winter sun.

Avoid exposure to strong winds, particularly if in a sea side area.



Tall trees can be used to induce a breeze at ground level.


SOLID BARRIER
PERFORATED BARRIER

Perforated barriers provide better protection than solid walls as they allow some balancing of pressure behind the barrier.

DESIGN FOR CLIMATE

Most of the above sketches are from "Schools, Design and Use" Commonwealth Schools Commission 1982

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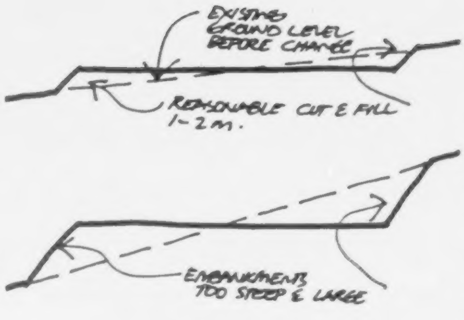
EXISTING GROUND LEVEL BEFORE CHANGE
REASONABLE CUT & FILL 1-2m.
EMBANKMENTS TOO STEEP & LARGE

PLAYING FIELDS ON STEEP SLOPES ARE IMPRACTICAL & UNECONOMIC

- steep slopes on south sides of hills limiting sun penetration in winter
- steep slopes toward prevailing breezes may induce unacceptably high wind currents around buildings
- steep slopes away from prevailing breezes may limit cooling breezes
- additional cost to foundations of buildings on sloping land
- hazard in bush-fire prone areas as fires rush quickly up hills

Screens and screen planting can be used to modify terrain. Careful configuration of buildings can minimise "wind-tunnel" effect.

Playing fields are a problem on steeply sloped sites. To a certain extent, retaining walls can provide level areas, but for large areas this is possible only on minimum slopes.

A flat site

A flat site allows maximum flexibility in planning but is not without problems. Among the problems of a flat site are:

- deep trenches may be required to provide adequate falls for drainage
- lack of scenic interest
- shielding from prevailing cooling breezes
- potential to flooding particularly if the site is near a water course

Generally, if cost is a major factor a gently sloping or relatively flat site is preferable to a steeply sloping site.

Planning for natural hazards

Bush Fires

- Maintain clearances from build-up of undergrowth and debris
- Good access for fire-vehicles
- Clearly defined escape routes to safe areas
- Lower fire risk by carefully choosing external wall material

Flooding

- Floors above flood level (design for 100 year flood - obtain information from local Council)
- Escape routes clearly defined for both pedestrians and vehicles
- Continued use of services in times of flood.

Rescue-refuge areas

Schools often serve as a shelter and refuge for local residents in times of disaster.

In high risk areas planners should provide suitable facilities such as rooms insulated against heat, above flood levels, with protected

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access to toilets and showers as well as cooking facilities (school canteen).

3.3.3. The Climate

After educational factors, climate is next in importance in building design. Different climates will dictate specific design choices:

Hot and dry

Requires good ventilation and insulation together with air-conditioning in extreme circumstances, in this instance evaporative cooling will be the most economical - refer section 5.3.4.

Brick or concrete block walls and concrete floors are useful as heat absorbers. It may be helpful to provide means of limiting ventilation if the hot air only contributes more heat and no relief.

External shading is helpful in providing shelter to students out of class as well as cooling the air coming in to the buildings.

Hot and humid

A hot and humid climate requires good ventilation and insulation with air-conditioning (in this case with de-humidifying capability). Reverse cycle air-conditioning is useful if both heating and cooling are required.

This kind of climate requires plenty of openings in walls with space around buildings to promote free flow of air (except where there is total reliance on air-conditioning).

Temperate

No special requirements apart from ventilation and insulation to conserve energy.

Cold climates - dry or wet

Buildings should be well insulated, in extreme climates even to the extent of double or triple glazing of exterior glass areas.

Facilities should be constructed with limited external openings and should rely on internal corridors for access between classrooms.

A cold site

A site may be particularly cold for a number of reasons:

- on the lee of a hill not exposed to winter sun
- exposed to prevailing cold winds
- protected over much from morning sun by, for example tall buildings or a large bank of trees on an adjacent site

In such circumstances the designer should locate buildings where they will receive sufficient direct sunlight but wind will be controlled adequately. Sun and wind need consideration in playing areas as well. It may be more efficient to provide warmth artificially within buildings in order to maximise benefits of sun and wind protection for external areas.

TYPICAL ATMOSPHERIC CRITERIA
(Low Physical Activity Area)

	Ranges	Desirable	Tolerance
Temperature	Outside temp 32°C 0°C	26° 22°	±2°
Relative Humidity	Outside temp 32°C 0°C	50% 30%	±5%
Outside Air	litres/second per person	7↔14	3.7
Air Changes/hr		6↔8	5
Air Movement	metres/second	7.6↔12	±3

NOTE Summer temperature comfort is acceptable at 25-27°C if R.H > 60% .Winter 18.5°C is OK if adequate clothing is worn

EFFECT OF CLOTHING ON COMFORT

Type of clothing	Comfortable temp for person sitting
Nude	28.5°C
Shorts & T-shirt	25
Slacks & Pullover	22
Lounge Suit	18
Overcoat & Gloves	14.5

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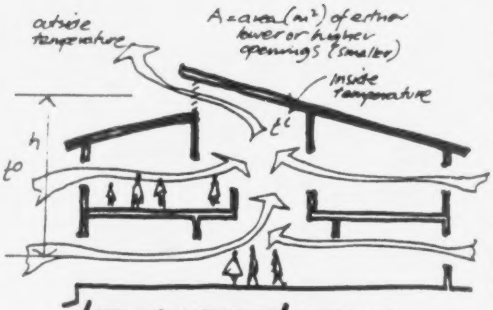
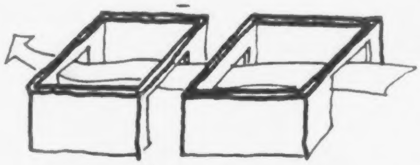
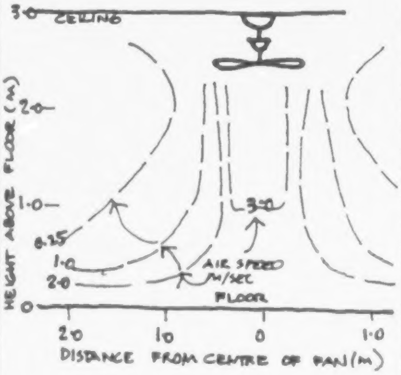


'STACK EFFECT' USED TO INDUCE AIR FLOW

$$V = \text{volume of air flow } (m^3/sec) = 0.121 \times A \times H \times (t^i - t^o)$$



IN AREAS OF LITTLE AIR MOVEMENT CREATE CLEAR PATHS FOR AIR TO FLOW



Circulating Fans for Air Movement

Ceiling fans assist cooling where there is little natural air movement by mixing air in contact with the structural mass of the building cooled the previous night.

Ceiling fans cover a greater area than vertically mounted fans and at more comfortable air speeds.

Ceiling fans must be mounted not less than 2.2m above floor level. This means that ceilings should be not less than 3m, less than this and the ceiling will be too close for effective air movement.

A windy site

When designing for windy sites avoid:

- creating wind tunnels between buildings
- creating turbulence with roof forms and fences
- trapping more wind by high barriers, including fences and buildings, which can funnel air to openings between buildings. Channel air to where it will have the least impact on people.

Wind can be controlled best aerodynamically, taking positive and negative pressures into account and maintaining the correct balance:

- Trees can assist in modulating wind but can also create other problems. Trees with dense foliage and in rows can increase air flow at ground level. Conversely trees with sparse foliage can help modulate air flow.
- Fences, if solid, will create eddies behind them. Fences with a degree of perforation will allow some air through and offset the negative pressure behind them, thus allowing the wind to be deflected up over the fence.
- Sloping roofs facing the wind deflect it but, without balance from air moving around and through the building, they can create eddies similar to the case of unperforated fences.

These effects can be predicted by experienced consultants. Master Planners should seek professional advice if the school is to be located in areas of extreme winds.

A site with little air movement

Measures deleterious in a windy site can be turned to advantage in one with limited air movement. For example:

- banks of trees with dense foliage can be planted to trap air and bring it to ground
- roof forms can be chosen to deflect any air currents and create movement where required
- interior layout of buildings can be arranged to create a stack effect. This is the application of the principle that air tends to move from higher to lower pressure areas – the lower pressures are usually at higher levels. A building with tall spaces with ventilation both at the top and the bottom will produce an air flow.
- arranging for openings in walls that are exposed to prevailing breezes. This is well illustrated in chapter 5 of the Building Energy Manual.[1]
- ceiling fans can be installed within the building to promote circulation

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[1] *Building Energy Manual as published by State Projects NSW Public Works.*

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3.3.4. Students and Staff with physical disabilities

For people with limited independent movement

Current legislation in NSW requires that public buildings provide access for people with disabilities at least to the ground floor of buildings. Schools would be so categorised and should therefore provide for access for students and staff who have difficulty with walking, or indeed confined to wheelchairs[1]. The design of the school will need to provide for:

- wheel chair access to all spaces
- additional space in classrooms for manoeuvring wheel chairs
- protection for walls from wheel chair impact
- doorways of standard width are generally adequate for wheel chairs but may need additional protection at floor level
- toilet designed for wheel chair access
- ramps and/or lifts in multi-storey buildings
- additional handrails in corridors for ambulant but disabled students

For students or staff with sight or hearing limitations

People with sight and hearing disabilities require only limited design modifications:

- tactile signs
- changes in floor textures to assist in identifying changes in level (stairs and ramps)
- hearing loops and microphones in classrooms may be required although many students capable of being integrated can rely on lip reading

3.3.5. Security - vandalism aspects

Security design considerations are covered in this section. The level of need for security will vary with the locality. Schools in some localities may require a major commitment to providing protection.

Where security and vandalism are an issue the following should be given planning consideration:

- a means of controlling the periphery of the building site - this may mean a fence or the external envelope of the building being continuous, with gaps between buildings protected by gates
- all external openings having secure doors and windows
- maintaining free egress (escape) at the same time as controlling ingress (entry).

Security systems and vandalism are also covered in sections 2.6.2, 3.9 and 5.3.6.

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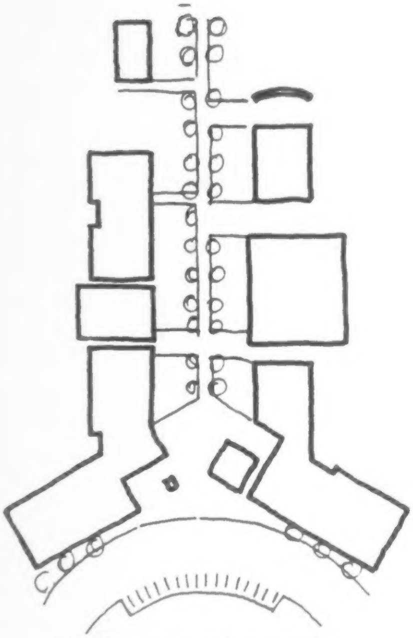
[1] *Disability Discrimination Act No 135, 1992 clauses 22 and 23*

3.3.6. Limitation of site area

Where schools sites have severely limited space, school planners should:

- seek permission to use nearby public play spaces such as a local park or playing field. This scenario may not be a feasible long-term solution; (councils and neighbours do change)
- consider transporting students to local playing fields
- consider construction of multi-storey school with play spaces under or on top of building
- incorporate play spaces within the building as roof terraces

The lack of play spaces may be less relevant in Secondary schools, (particularly Senior Secondary schools) than in Infants and Primary schools.



AXIAL ARRANGEMENT

3.4. Variations of building arrangement

There are almost as many varieties of ways to arrange a school plan as there are schools.

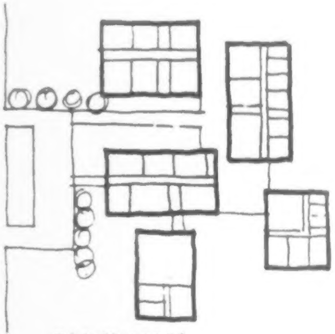
This section of the Guide refers only to the basic and broad planning concepts, not the detailed planning of those buildings or rooms.

The purpose in defining these is to illustrate some basic concepts - most schools will be a derivative on one or more of these basic concepts.

3.4.1. Axial

An axial arrangement means the groups of rooms are centred about one or more axes - either in parallel or angled.

The outcome is usually a fairly formal arrangement. This arrangement can usually only be used where land is in plentiful supply. Landscaping is sometimes used to enhance or emphasise the axis or axes.



PAVILIONS

3.4.2. Pavilions

Where groups of rooms are enclosed in a building and several buildings form the school complex these may be referred to as pavilions.

They may be arranged formally or informally. They may be linked by covered ways or totally isolated from each other.

The principle advantage is that for a developing school each stage of the project can be a finished building.

One disadvantage is that the potential for adaption to other uses may be limited, except where these may be foreseen and planned for.

Another disadvantage of this form of building arrangement is that as the size of the pavilion decreases the proportion of external surface (wall and roof) increases with subsequent increased initial costs and running costs (due to greater potential heat loss or gain in areas of temperature extremes).

This arrangement is ideal on steeply sloping sites where the pavilions can be built running parallel to the contours and stepped down the site with the covered links over ramped or stepped access.

3.4.3. Single Shell

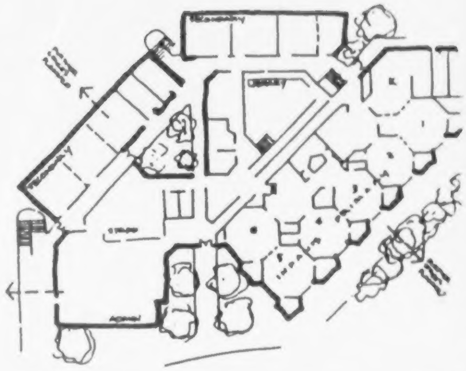
The single shell is where all the facilities of a school are housed in a single building.

A disadvantage is that it is more difficult to build in stages.

It allows much greater flexibility in modification and adaption to other uses.

The fundamental concept for construction could be likened to a shopping centre with a large roof supported by beams and steel columns with roof lights providing light and ventilation to the inner parts of the building. All of the interior walls are lightweight construction, steel framing and plasterboard. These can be removed without endangering the main structure allowing maximum flexibility for change of use as needs change.

An example of this form of construction is Pacific Hills Christian School at Dural, NSW and to a lesser degree Plenty Valley Christian School in Victoria.



PACIFIC HILLS CHRISTIAN SCHOOL STAGES 1&
ARCHITECTS NOELBELL·RIDLEY SMITH · STAGE 1
A.K. WERRY STAGE 2

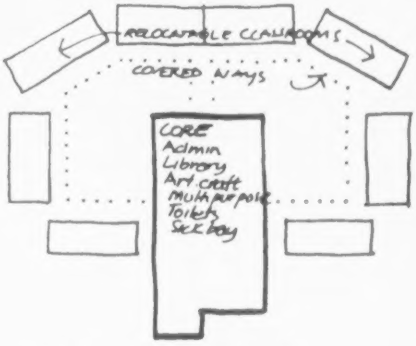
3.4.4. Rooms around a series of courtyards

There are various ways courtyards can be used in school planning. They can be closed courtyards or open courtyards. The former is where access is only through the building. The latter where the buildings are arranged around an open area.

It is a compromise between the pavilion concept and the axial concept. It allows a degree of flexibility and adaption. Covered access can be provided at lesser cost than in the pavilion concept, the covered access provided by wider than usual roof overhang and being closer to other buildings.

3.4.5. Core-Plus Concept

The core-plus concept, developed by Clarke Hopkins and Clarke Architects, allows change with minimum fuss and impact. It provides a basic core to which a series of classroom blocks is added as required.



CORE PLUS CONCEPT
Bayswater North Primary · Vic

The core would comprise the basic administration and staff facilities such as Principal's office, administration. staff rooms, store and students toilets.

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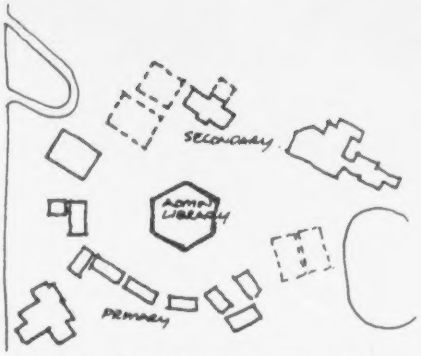


OVERNEWTON ANGLICAN COLLEGE
KEILOR, VIC
FORWARD, VINEY, WOOLAN; ARCHITECTS

Surrounding the core, depending on terrain, climate and orientation, may be a series of courtyards bounded by walkways to which relocatable or permanent classroom facilities may be added as required.

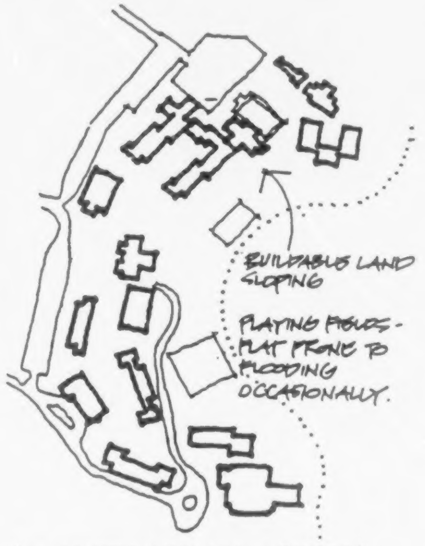
This concept may not be the most appropriate arrangement where numbers are low as the Commonwealth Government "globals" may be exceeded. Even so, the core can be designed to contain spaces which can be used as classrooms for later conversion to other uses:

- a library may serve as one or two classroom spaces
- a staff room may serve as a classroom
- a small space may be used by staff until conversion to its final use, for example, as the general office area.

An example of the Core-plus concept can be seen at the Bayswater North Primary School in Victoria, designed by Clarke, Hopkins and Clarke, architects.

3.4.6. Buildings circling central space

An excellent example of buildings arranged in a circle format is All Saints in Mudgereeba, Qld where the buildings are confined to the sloping and only area available for building – all are facing the playing field which is prone to flooding.



ALL SAINTS ANGLICAN COLLEGE
MERRIMAC (MUDGEERABA) QLD
BURLING, BROWN & PARTNERS, ARCHITECTS

3.5. Recycled Buildings

In the course of this study a number of schools were visited or investigated because they had adapted buildings and site which were originally designed and used for totally different purposes.

These examples below included here by way of encouragement to others. The former uses in some cases are so unlike the current use that it seems to suggest that almost any building might be capable of being adapted with sufficient enterprise and creativity.

Belmont Christian Community School (Belmont NSW)

This school is constructed on the site of the John Darling Colliery. The buildings which have been adapted are the office building and the miners wash house. This latter building was large enough, with a minor addition to house the entire single-stream primary school.

The secondary school, still developing toward full enrolment, is housed in what were the laboratories, drafting offices and mess rooms.

Byron Bay Community School, Byron Bay

The school was established originally in a shop and adjacent residential block. Since then another house has been purchased and converted to another school classroom. Part of the original shop has been demolished and a new facility established at the rear to provide staff amenities and office. A new building comprising two

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classrooms has also been constructed on the site, all on three residential blocks, all carefully master-planned and coordinated.

Temple College in Adelaide

The school has been established in a city environment in a disused winery warehouse and office complex. Classrooms have been constructed inside the large warehouse facility. It has been relatively easy to provide large covered assembly areas in what was the truck dock area.

Bega Valley Christian Parent-controlled School

This school commenced in 1995 and is housed in buildings originally designed as an abattoir (but never used for that purpose) with additions and modifications as required to suit the school's needs.

Portside Christian School - Adelaide

Portside is a developing area on the northern perimeter of Adelaide. The primary school, incorporating a preschool, was constructed originally as a works development site for SACON. The existing accommodation was adapted for use as classrooms and new, purpose facilities were developed for the administration, library and Art facilities.

Two disadvantages in adapting the site to new uses were the difficulties of access, the site being the "gateway" to Portside, and the oversized rooms – appreciated by staff but further development is limited due to Commonwealth Government global area guidelines. An "exceptional circumstances" case may have to be argued if capital grants are sought.

Christian College, Highton, Geelong, Victoria

Here a large building built as an orphanage has been adapted for use as a Primary and Secondary school. The traditional dormitories were capable of being re-subdivided to provide ideal class sizes in most cases. The principal disadvantage in the early days was overcoming the problem of exceeding Commonwealth Guidelines - this being a completed building and far bigger than the school could justify in the early days of the schools existence.

Planning changes can sometimes assist to reduce the negative impact of such superfluous area.

Advantages of recycled buildings

There are a number of obvious advantages in using existing buildings:

- Time saving

The main part of the building is already in place – no time is required to lay foundations, minimal time is required to provide underground services

- Infrastructure in place and can be assessed

The soundness of the construction is immediately evident and the building is ready for assessment as to suitability to the proposed use.

- Cost savings

The level of savings will vary with the circumstances. Timing may be the main saving. In the Belmont example there were significant savings in terms of main structure.

- Atmosphere can be stimulating

Recycled buildings often have unique character. Elements of the existing site should be preserved where possible to retain this uniqueness.

Disadvantages of recycled buildings

There are disadvantages, although they can usually be overcome. Some of the disadvantages are:

- compromises are usually required

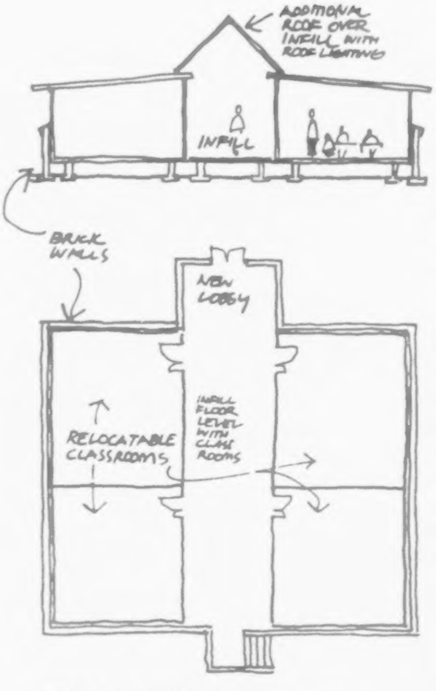
It would be unusual for a building already constructed to suit the school's needs perfectly, but this need not be a significant constraint.

- tendency to "make do"

Because "it is there" a tendency exists to make do. Provided there is sufficient determination among the master planning team to seek the very best, this difficulty can be minimised.

3.6. Relocatable Buildings

Relocatable or transportable buildings have been commonplace in the school scene for many years. They are an ideal response to urgent needs and to "humps" in the demand for accommodation.


ADDITIONAL ROOF OVER INFILL WITH ROOF LIGHTING
INFILL
BRICK WALLS
NEW LOBBY
INFILL FLOOR LEVEL WITH CLASS ROOMS
RELOCATABLE CLASSROOMS

RELOCATABLES MADE PERMANENT

The relocatable buildings currently in use comprise steel frames with rolled steel sheeting of varying patterns or aluminium covered plywood panels. Interior finishes are usually plywood panels rather than plasterboard which is more likely to be damaged in transit. Roofs can be flat or sloping - the latter is preferred as it gives an appearance of permanency.

Some schools plan to use relocatables in the long term by arranging them so that a brick skin can be built around them as a permanent finish. An excellent example is the primary section of Beaconhills Christian College at Packenham, Victoria. The class rooms have been arranged either side of a 3-metre-wide walkway built level with the floors. A roof with a continuous roof light was built over the centre walkway and the exterior enclosed in brickwork to match existing buildings on site. An imposing entrance transforms the building into a very satisfactory permanent building.

The needs of basic teaching spaces can be met relatively easily by the above methods primarily because the ancillary services such as plumbing and power and special furniture are fairly simple. These kinds of solutions are not as appropriate for special purpose classrooms.

The construction of relocatable buildings is not really any different to permanent buildings of framed construction, except for internal

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finishes, which is not a significant issue as they are often covered by pinboards.

If required, insulation can be specified to provide additional heat resistance/retention if required until permanent cladding is provided.

Advantages of transportable buildings

- Useful for schools during growth periods in which enrolments are not predictable
- An almost immediate response to accommodation needs
- Flexibility in providing accommodation
- Building progress not hindered by inclement weather

Disadvantages of transportable buildings

- Life of building is often limited due to the use of steel components, especially in coastal areas. It is not a significant factor if building is to be clad in more permanent material later, provided the exposed structural elements are galvanised.
- Energy waste. The lightweight nature of the buildings means that they do not insulate easily against heat gain/loss unless special steps are taken to provide additional insulation.
- Acoustics. Because of continuous framing between classrooms and lightweight construction, sound travels easily from one room to the next. This problem is not easily solved using traditional insulation methods.
- Limited opportunity to modify. The configuration designed specifically for transport on trucks limits expansion potential except in a linear formation.

Cost factors

Transportable buildings are not necessarily cheaper to buy or to operate. Their principle justification is flexibility in use and in providing space where needed in times of crisis/peak enrolments. Transportable or demountable buildings have a cost other than the building itself. Costs of infrastructure, (electrical, drainage, footings and water supply) and transportation to site as well as paths and covered ways need to be taken into account.

3.7. Energy Considerations

Schools should take a lead in establishing energy conservation as a way of life. This section covers energy conservation and cost minimisation as pertains to the design phase, and methods that schools can adopt to conserve energy.

An energy efficiency statement should be prepared early in the design phase as a standard for evaluating the design. The statement should include such matters as:

- comfort levels for occupants
- orientation of building
- design of building envelope (will there be additional expense to conserve energy?)

- controls to be available and monitored to conserve energy. Will staff be trained in the use of monitoring and control equipment
- degree of complexity for operation of the controls - sophisticated equipment may be more efficient but will staff be available and motivated to operate the equipment?

The most convincing argument for conserving energy is the guarantee of cost savings, as energy is an ongoing, major, non-capital expenditure contributing to a high proportion of total life-cycle costs (see section 1.5.8 for a discussion on life-cycle costing). Cost savings may be achieved by:

- efficient energy management of buildings
- applying financial evaluation methods to select the best design
- reviewing of supply authorities tariff structures to select the most appropriate method

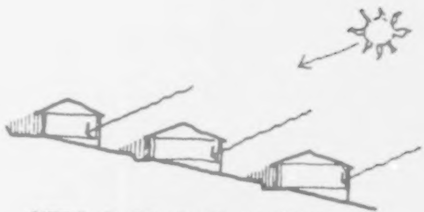
Some methods for conserving energy are:

- solar heating (3.7.1)
- reducing the area of the external envelopes of buildings (3.7.2)
- shading for summer months (3.7.3)
- careful attention to glazing - double glazing to minimise heat gain in summer and loss in winter (3.7.4)
- landscaping - keeping the ground cool around buildings will cool the external air coming into buildings (3.7.5)
- insulation (3.7.6)
- lighting design, to minimise heat gain in summer (3.7.7)
- selecting fuel types with stable costs (3.7.8)
- heat reclaim - reverse cycle air-conditioning (3.7.9)
- natural ventilation to reduce requirement for air-conditioning (3.7.10)
- off-peak electric storage (3.7.11)
- energy conserving tips (3.7.12)

3.7.1. Solar heating

Solar heating can be used where sufficient sunlight warrants the installation of the necessary equipment.

The school can obtain data from meteorological bureaus as to number of sunny days per year. This information can be evaluated by an engineer to compare the possible use of solar energy with the more usual means such as gas, electricity or other fuels. The higher cost of equipment and the amortisation, weighed against savings in energy may prove to be less cost effective than other methods..



SITES SLOPING TO NORTH ASSIST IN TRAPPING SOLAR ENERGY

Space heating

Solar energy for space heating is best where sunlight penetrates most rooms, such as site sloping to the north. A site in the shadow of tall buildings, hills or trees for the major part of the day in winter would not be suitable for solar heating.

References for further reading on solar heating can be found in Appendix 9.7.

Water heating

Solar energy for water heating is best where sloped roofs face due north (in the southern hemisphere) and are not shaded for the major part of the day. Panels can be located on frames remote from the buildings to achieve such exposure, but the heat lost in long runs of piping and the additional support structure costs may make the effort too costly. Before a decision is taken to rely on solar heating for water, a consultant should prepare a detailed study to determine the long-term cost effectiveness (life cycle cost).

3.7.2. Minimising the area of the building envelope

Minimising the contact area of the building envelope to external air (the envelope comprises the roof, walls and, where buildings are elevated, the floor as well) can reduce heat loss/gain and make temperature control easier.

Doing so can produce other design problems however such as limiting natural light and air flow through the building. Pacific Hills Christian School at Dural, Sydney have overcome these limitations with the use of roof lights with shade provided to control summer sun. They provide good natural light, good cross ventilation, sun in winter and, by virtue of careful design, summer sun does not penetrate the rooms.

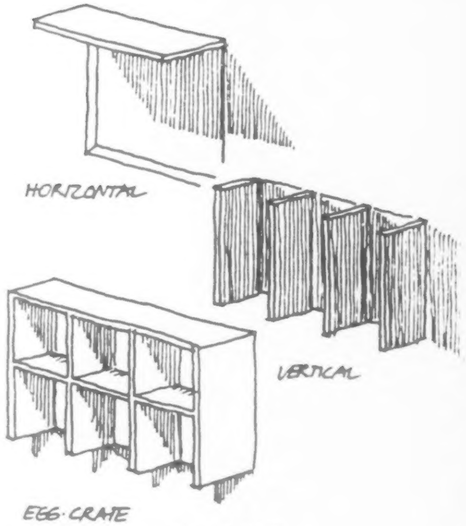
Sometimes access problems result from minimising the area of the building envelope, but they can usually be overcome. Incorporating internal corridors for access to class rooms can assist in reducing the ingress of air where extremes of heat or cold are likely, and as a result help to retain energy efficiency.

3.7.3. Shading

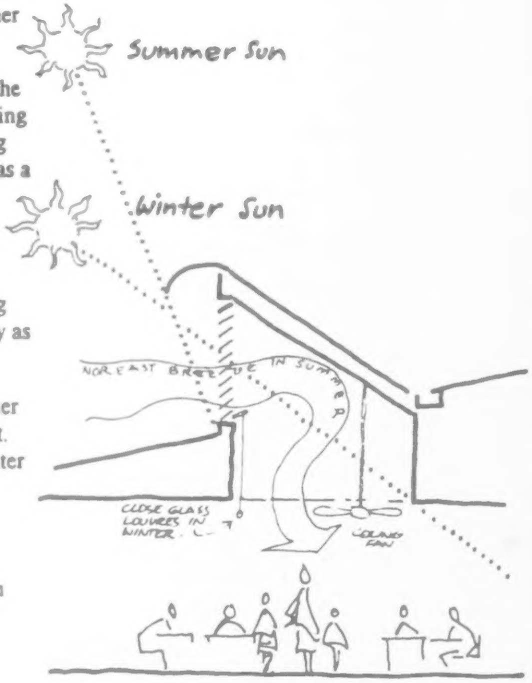
Shading of windows in summer is important, as energy radiating from internal elements does not flow out through glass as readily as solar radiation comes in. Hence heat builds up in rooms.

Shade structures need to be carefully designed to shade in summer and allow sun penetration in winter to achieve maximum benefit. Sun angles vary according to latitude and season: the sun in winter is lower in the sky than in summer. Therefore it is possible to design for sun penetration in winter while blocking it out in summer.

Tables and diagrams are available to accurately calculate the sun angles for any location in Australia. They may be found in "Sunshine and Shade in Australia"[1]. General principles of designing for the sun may also be found in "Solar Energy and Building"[2].



TYPES OF SHADING



Pacific Hills Christian School
Dural NSW.

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[1] *Sunshine and Shade in Australia - Experimental Building Station publication*

[2] *Solar energy in Building by S V Szokolay Edwards Arnold (Aust) P/L Melbourne*

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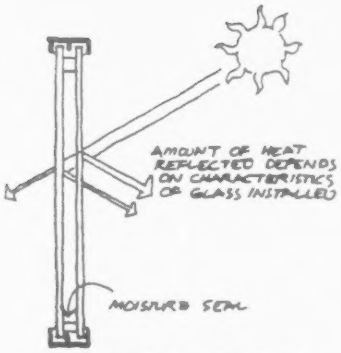
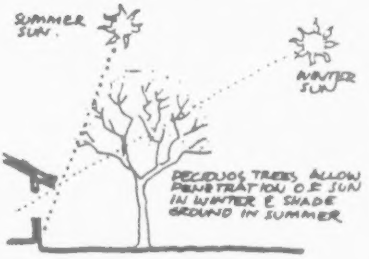
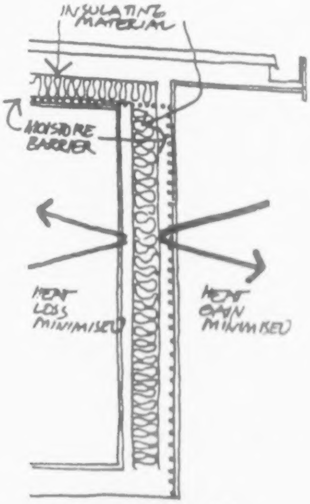

AMOUNT OF HEAT REFLECTED DEPENDS ON CHARACTERISTICS OF GLASS INSTALLED
MOISTURE SEAL

INSULATION ACHIEVED BY DOUBLE GLAZING


SUMMER SUN.
WINTER SUN
DECIDUOUS TREES ALLOW PENETRATION OF SUN IN WINTER & SHADE GROUND IN SUMMER



IMPORTANCE OF INSULATION

Other methods of shading include:

- deciduous vines or trees
- adjustable shade structures such as blinds, awnings and louvres

3.7.4. Double Glazing

Double-glazed windows utilise two panes of glass separated by a sealed air gap for insulation. The sealing must be carefully done as moisture trapped in the gap can condense, clouding the glass and damaging the frame.

Double glazing is required only where extremes in temperature occur or where noise levels are high. In very extreme weather conditions triple glazing is used, for example, in the Australian Alps.

3.7.5. Landscaping

The use of plants and trees around a building can be useful in controlling the internal environment. Deciduous trees and shrubs can provide shade in summer and allow sun to penetrate in winter. The landscaping should be designed so that plants do not impede air movement into a building.

In country areas, peppercorn trees (*botanical name Schinus Areia*) surrounding farm residences are a familiar sight. Their purpose is to keep the surrounding ground cool by shading. As air flows across the shaded area the ground acts as a "heat sink" absorbing the heat from it and providing cooler air to flow on through the rooms of the building.

3.7.6. Insulation

Insulation for energy conservation involves using material which, by its nature, forms "cells" of air which resist the flow of heat. Different materials have differing resistance to heat flow. Increasing the thickness of the material also increases its capacity to resist heat flow. Fibreglass filament – (concern about the use of fibreglass fibre has led to specifications calling for it to be wrapped in polyethylene film) in the form of batts or blankets, slag wool, dacron blankets, treated mulched paper, natural wool or similar material all provide insulation. Another form of insulation used in ceilings is loose fill of cellulosic fibre.

Careful analysis of all surfaces of the building exposed to external air mass, including the floors, should be done to determine the need for insulation.

3.7.7. Lighting design

Another way of limiting energy use is through good design of lighting. Maximising use of natural light, reduces the power used by artificial light and the resulting heat load.

Some classrooms in secondary schools are vacant for long periods of time. In such rooms ways of saving lighting energy should be explored. Possibilities include:

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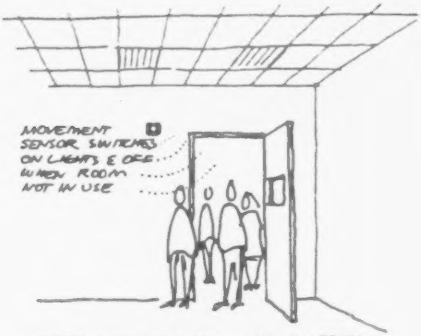
- movement sensors which switch lights off after a pre-determined period
- timers - providing lighting for a period slightly in excess of usual teaching period
- a "switch-off" signal through the light circuitry after school hours

While switching lights on and off in large areas decreases lamp life, it is still economical to do so.

Seek advice of professional consultants before selecting any of the aforementioned methods. Refer also 5.2.13 Light Reflectance and Glare Factors.


MOVEMENT SENSOR SWITCHES ON LIGHTS & OFF WHEN ROOM NOT IN USE

AUTO. SWITCHING OF LIGHTS SAVES ENERGY.

3.7.8. Fuel types with stable prices

Fuels likely to fluctuate in price should be avoided, as a sharp increase in such fuels, and hence energy costs, can lead to an administrative push for a change of equipment, meaning additional capital costs.

3.7.9. Heat reclaim and reverse-cycle air-conditioning

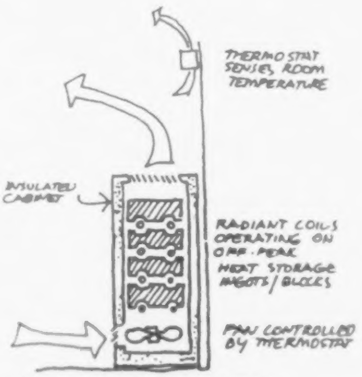
In climates where extremes in temperature do not occur, reverse cycle air-conditioning is a viable method of both cooling and heating. Reverse cycle air-conditioning provides cooling in summer and heating in winter and is regarded as an economical way of providing comfortable conditions in humid environments. Reverse cycle systems are more efficient in terms of energy use than other forms of air-conditioning. More about air-conditioning can be found in section 5.3.4.

3.7.10. Natural ventilation to reduce requirement for air-conditioning

This form of cooling is cheapest but works well only where air flow is sufficient in the building (for cooling by evaporation of perspiration) or where the air is sufficiently cooled through natural means (by flowing across a cool surface e.g. shaded ground).

3.7.11. Off-peak electric storage

A very efficient form of off-peak space heating is referred to as "heat banks". These comprise ingots of steel or masonry blocks containing radiant electric cables that are switched on during off-peak periods. The blocks are housed in an insulated cabinet with vents at the bottom and top, with a fan switched on by a time clock and controlled by a thermostat during school hours. They are best in climates that are cold for sustained periods.


THERMOSTAT SENSES ROOM TEMPERATURE
INSULATED CABINET
RADIANT COILS OPERATING ON OFF-PEAK
HEAT STORAGE INGOTS / BLOCKS
FAN CONTROLLED BY THERMOSTAT

OFF-PEAK ELECTRIC STORAGE HEATER

3.7.12. Energy conservation tips

A conclusion of the OECD Conference on Managing Energy in Schools [1] was that energy costs can be reduced by occupants being willing to accept organisational change and to take care of the school environment. Practices that can reduce use of energy include:

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[1] *The Will to Manage Energy in Schools – Conclusions of an OECD seminar in Vienna May 1984*

- keeping doors closed
- adjusting thermostats to moderate conditions (should be done with care by maintenance staff)
- wearing suitable clothing
- switching off lighting when daylight is adequate or when rooms are not in use
- zoning of areas for after hours use to minimise heating/cooling and lighting.

3.8. Building Services

In this section, building services are covered as pertains to master planning and design issues. The degree to which schools rely on building services (water supply, drainage, gas, power, data and transport) can determine the way a school should be constructed and arranged on a particular site. For example, a school built on a significant slope with restricted access to a sewer (e.g. where only part of the site has the potential of gravity falls to a sewer) is limited in where it can locate the buildings that require sewerage facilities; buildings requiring access to heavy vehicles for delivery of equipment and materials (agriculture or technics for example) should be located to avoid having to cross roads used heavily by students or other pedestrians.

Relevant and qualified consultants will provide necessary expertise to ensure that required facilities will be provided.

3.8.1. Water supply reticulation

Buildings and site must be planned to ensure that sufficient pressure and delivery capacity is available to support drinking and washing needs, toilets and fire fighting.

For further information regarding reticulation within the buildings refer section 5.3.2

3.8.2. Sewerage systems

Health regulations require either connection to a sewer or the installation of a satisfactory on-site sewerage system, such as:

- septic tank with effluent drained into absorption trenches
- a packaged sewage treatment system with disposal by settling tanks, evaporation beds or spray disposal on playing fields or a combination of the above
- a pump-out system where sewage is drained to a tank and macerated for pumping via a pressure line to a town sewerage system. This applies where a site does not have potential of gravity fall to a sewer
- in certain cases, absorption by special grasses planted in settling ponds. Such a facility has been installed at the Cape Byron Bay Steiner School, Byron Bay, NSW. (Refer Appendix 9.10)

- sewerage system drained to a tank and pumped out by a tanker, which is unsatisfactory unless the tank is large enough for several days load.

3.8.3. Electrical light and power

Local supply authorities should be approached to determine whether there is adequate power supply on the local grid and if not how to provide it (see 5.3.1 for more detailed coverage).

Switch rooms and conduits should be sufficiently large to cater for maximum power requirements with scope for further growth. Ideally, switch rooms should be:

- as close as possible to the power source, as cabling is expensive
- centrally located to minimise runs to sub-boards
- accessible for meter readers and urgent maintenance
- positioned to enable vehicle access for transport of major components such as new or replacement switchboards
- readily accessible to the fire brigade to switch off power in the event of a fire

For more information refer to 2.2.3 and 5.3.1.

3.8.4. Communications

There is an increasing need for schools to be aware of technology, to incorporate it in the teaching process and to directly include it in the curriculum.

Schools should obtain the very latest and best advice available on communications equipment and networks. Among the important communications services are:

TV and Video

A variety of suitable networks are available for distributing signals around the school buildings, including remote control of those signals. Audio visual equipment is usually centred in the library where the video tape may be placed in the machine by the librarian or technician. From that point on control is in the hands of the teacher in the classroom.

Satellite

In the future, schools may be required to include satellite dishes to pick up broadcasts of lectures for students in TAFE courses as part of their senior studies.

Telephone

Given the relative value of staff time it is probably best to provide ready access to phones. The disadvantage of ready access to phones is abuse by students (e.g. using phones to signal a false alarm of an emergency situation). A safeguard against abuse is to provide a public phone for student use, but locate it in a place open to view by staff.

Intercom

Intercommunication for staff can probably be best provided by means of the PABX telephone system.

Computer networking

With current advances both in technology and educational priorities a sophisticated computer network throughout the school is becoming a priority. Consideration should be given to networking:

- classrooms
- staff or senior student studies
- staff/student homes (via modem)
- international data-bases

Schools cannot afford to downplay the significance of developments in this area. On the other hand: *Computers and video may be the hottest topic among educators, but . . . 'We don't want to repeat the mistake we made with language labs . . . creating large spaces that aren't really needed.' Rather than setting up computer labs . . . the new technology (should be integrated) within traditional classrooms"*[1].

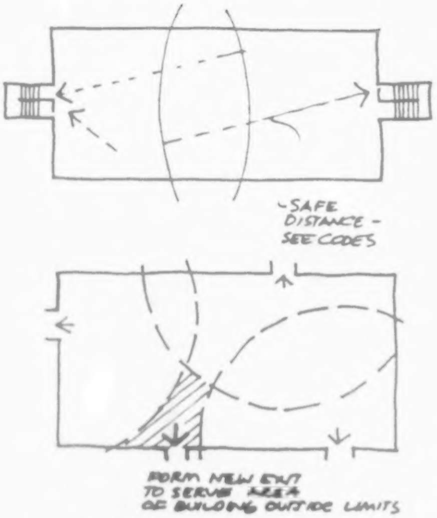
The debate among educators continues on this issue, particularly at the primary school level.

3.8.5. Fire Safety

Fire safety regulations

In designing for fire safety, regulations govern construction methods on such matters as:

- distances to safe exits
- size of passages and stairs
- location, size and type of fire fighting equipment
- choice of materials
- means of isolating and stabilising fire.


SAFE DISTANCE - SEE CODES
FORM NEW EXIT TO SERVE AREA OF BUILDING OUTSIDE LIMITS

CHECK DISTANCES FOR REQUIRED EXITS FROM CODES

The Building Code of Australia requires that locks on all doors to rooms and passages forming part of required escape routes (as defined in the regulations) to be such that doors can be opened by a single-handed action. Secondary locks are forbidden.

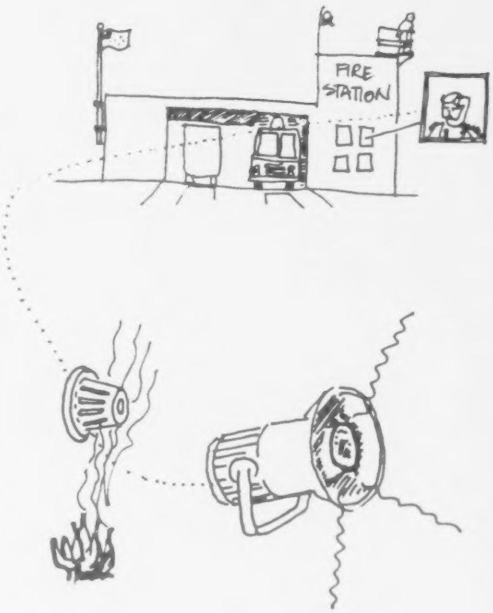
These regulations are written for professionals in the construction industry - seek advice from architects for their interpretation.

Management and training for fire safety

Buildings designed to be safe from fires remain so only when management monitors the environment, maintains equipment and fire services, and trains staff and students in safe behaviour in the event of disaster. Consider making fire safety procedures part of the overall training for staff and students.

---

[1] *Clifford A Pearson in Architectural Record January 1991*



Evacuation plans – design

At a very early stage in the planning process the broad parameters of fire safe practices and designs for schools must be understood. Before the building is occupied an exit plan should be prepared and available to staff. Evacuations of the building should be rehearsed frequently.

Evacuation from buildings may be required for dangers other than fire. The evacuation process for fire may differ from that of other potential hazards or threats.

Evacuation systems

There are various means of ensuring people escape from the building in emergency:

- an alarm bell
- public address system. Some public address systems have a range of warning buzzers and bells as part of the standard mechanism. Staff and students need to be trained in the system and use.
- escape routes need to be identified

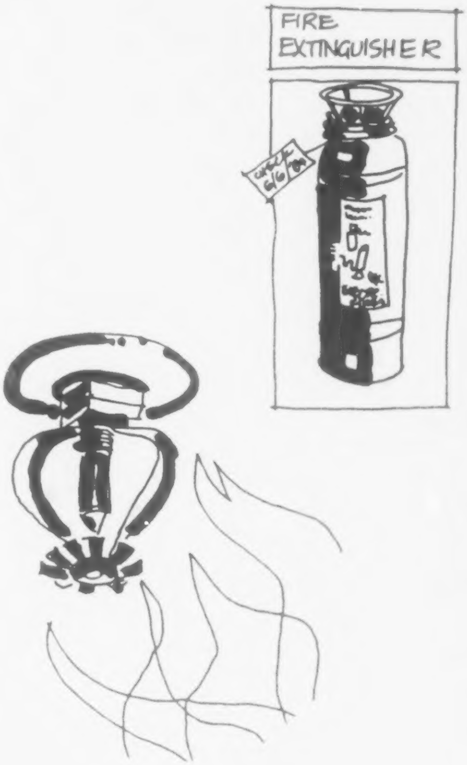
Bush Fires

In areas threatened by bush fires the safety procedures need very careful thought in consultation with the local authorities. The school may well be the community haven in event of bush fires.

Fire suppression systems

Fire suppression systems comprise:

- fire blankets. They should be available on walls in high risk areas such as kitchen, science and technology areas
- sprinkler systems. Sprinkler systems would usually only be applicable to schools in multi-storey buildings.
- shut-down mechanisms on ventilation systems. These are required in areas where mechanical ventilation exists and where the systems need to be shut down automatically to minimise the spread of fire.

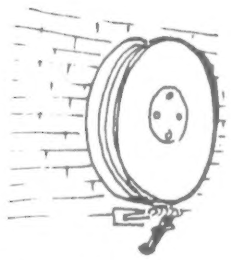


Fire warning systems

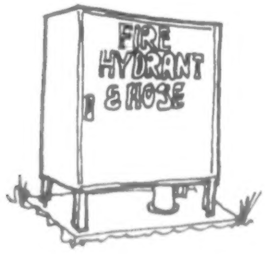
- smoke detectors. These are the most common form of alarm or warning system. They should be connected to an alarm in an area likely to be staffed while ever the school is occupied. The staff need to be trained in quick detection of false alarms what to do in case of a real fire. Detectors should be tested regularly.
- heat detectors. These detect heat rather than smoke. They are useful in areas where flammable material is likely to produce more heat than smoke (e.g. flammable liquids) and where a very early warning sign is important.

Fire fighting systems

- fire extinguishers. Different types of extinguishers are used for different types of fires. Professional advice should be obtained from the local fire brigade.



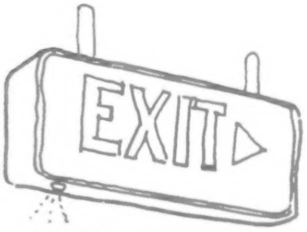
FIRE HOSE REEL



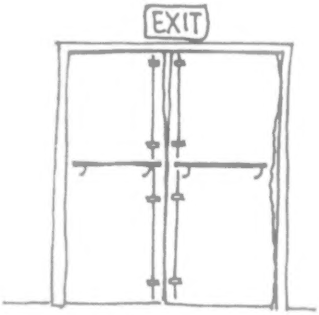
FIRE HYDRANT & HOSE IN CABINET

- fire hose reels. They are generally required by the fire safety authorities - their location recommended as part of the building approval process. They are capable of being managed by school staff. Staff should be required to become familiar with and trained in their use and location.
- fire hoses. They are used generally by trained fire fighters only, as the quantity of water carried by these larger hoses is generally unmanageable by untrained staff. They are required where brigades are not readily able to bring vehicles onto the site.
- fire hydrants. These are large pipes with valves connected to the town water supply and suitable for connection to fire brigade hoses and fire pumps to boost the available water pressure. Building codes govern their installation. Ensure that staff are advised of their use and location.
- fire brigade. They should be invited to participate in preparing the escape plans for the school. The fire brigade should also be able to offer advice on:

  - fire fighting systems
  - alarm systems
  - keys to be used in emergencies
  - location of the electrical switch room



BATTERY POWERED EXIT SIGN WITH SIGNAL LIGHT INDICATING SERVICEABILITY OF RECHARGING SYSTEM



Exit and other signs

Important parts of the fire safety design of the school are the exit signs and emergency lighting systems. They are efficient only if they are maintained in working order.

Older style of emergency and exit lighting systems were powered by a central battery system, the wiring being in fire-isolated environments, conduits or sheather cable (MIMS = Mineral insulated metal sheathed).

The current trend is to provide each unit with an internal battery and a trickle charge system connected to mains power. When the mains power is cut the internal batteries provide sufficient power for exit signs and lights.

These units have a signal light which indicates that they are operating. They must be checked on a regular basis - a certificate is usually required, issued by a recognised authority, indicating that the equipment is serviceable.

3.9. Security – Buildings, Personnel and Property

With the increasingly sophisticated and expensive equipment in schools, security is an important issue. A secure building arrangement and systems for monitoring and sounding alarms are therefore necessary. School planners should ensure that:

- entrances are well lit and resistant to forced entry

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- windows that open should be fitted with strong locks
- external building material should not easily be damaged
- fences and gates should be lockable to vehicular traffic (except for emergency access by fire trucks and police vehicles - supply keys to local brigade and the police)
- surveillance is easy for patrolling security staff
- all entrances are highly visible to staff during school hours to monitor who is coming in to or out of the building
- staff and students are provided with safe and secure storage for personal property

Security, Alarm and monitoring systems

There are a variety of systems available for consideration including:

- alarms which are activated by sound, heat sensors, movement, glass breakage, magnetic switches on doors and windows which detect the opening of windows and doors
- surveillance cameras including video recording of all movement activity at critical points of the building
- master key systems
- security key systems - programmable keys which record when used
- programmable cypher pads to control access including the time access is permitted
- security firms who supply personnel and/or systems
- links to police or security firms

For more detailed information and recommendations refer to "Safety and Security in Educational Buildings"[1]

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[1] *Safety and Security in Educational Buildings - OECD Seminar May 1987*

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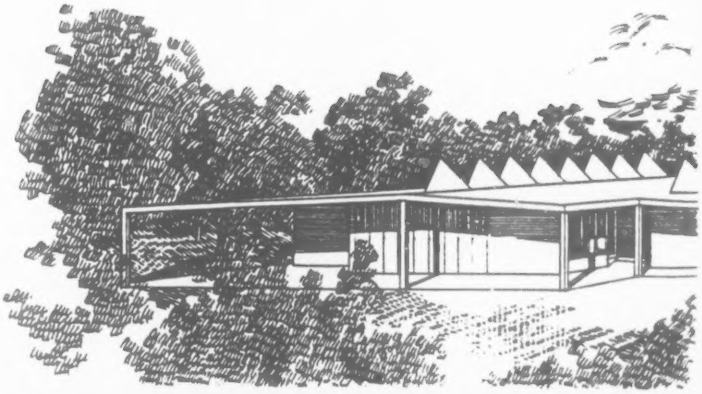
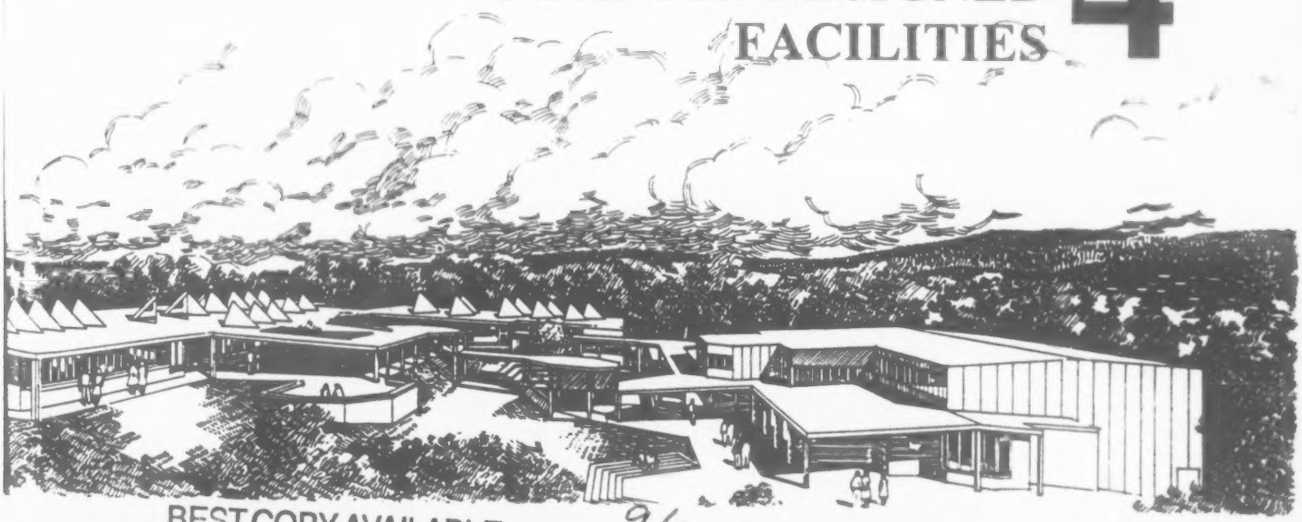


School Buildings Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

PURPOSE DESIGNED FACILITIES 4



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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1 Introduction and Chapter 1 – Developing a Master Plan
2 Chapter 2 – Making the Most of Your School Site
3 Chapter 3 – Principles of Good School Building Design
4 Chapter 4 – Purpose Designed Facilities
5 Chapter 5 – Construction Methods and Materials
6 Chapter 6 – Managing the Construction Process
7 Chapters 7 and 8 – Technology and Managing Buildings
8 Appendices

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

Contents of Booklet 4

4. School Buildings - Purpose Designed Facilities

4.1. Lecture Spaces / Seminar Rooms..p 77
4.2. Classroom spaces ..p 78
4.3. Teaching and Practical Activities..p 80
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4.5. Special Students Learning Areas..p 86
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4.7. Staff studies..p 88
4.8. Staff recreational area - common rooms..p 89
4.9. Service spaces, toilets, canteens, stores, maintenance..p 90
4.10. Assembly spaces, both indoor and outdoor..p 92
4.11. School Administration..p 94
4.12. Access ways and student storage (lockers)..p 95
4.13. Caretaker and Staff Accommodation..p 96

4

School Buildings Purpose Designed Facilities

4. School Buildings - Purpose Designed Facilities

The kinds of spaces required in schools will be examined in this chapter. When planning schools it is helpful to list the required spaces in a logical format by usage, similar to items 1-13 below. These items will be covered in further detail in this chapter.

1. Lecture Spaces/Seminar Room – film/video, TV/radio broadcast (4.1).
2. Classrooms sometimes referred to as General Purpose Learning areas (GPLA) – students seated for the whole lesson (4.2).
3. Specialist rooms or Special Purpose Learning Areas (SPLA) – teaching with significant involvement of students in practical activities requiring them to move about, work at benches or machines, and use computers (4.3).
4. Student activity with significant independent student activity related to private research and study (4.4).

> *..the requirements of specific school spaces with examples from schools*

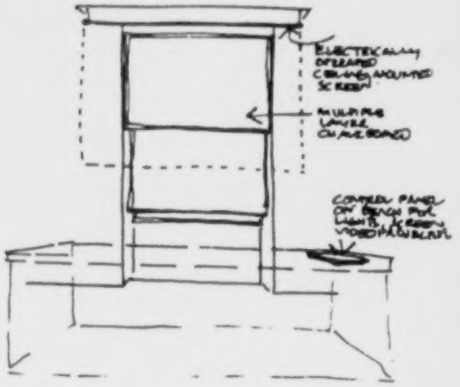
5. Special Students Learning Areas (4.5).
6. Student recreational activity (4.6).
7. Staff studies (4.7).
8. Staff recreational - common rooms (4.8).,
9. Service spaces, toilets, canteens, stores, maintenance (4.9).
10. Assembly spaces, both indoor and outdoor (4.10)
11. School administration (4.11)
12. Access corridors and student storage lockers (4.12)
13. Caretaker and staff accommodation (4.13)

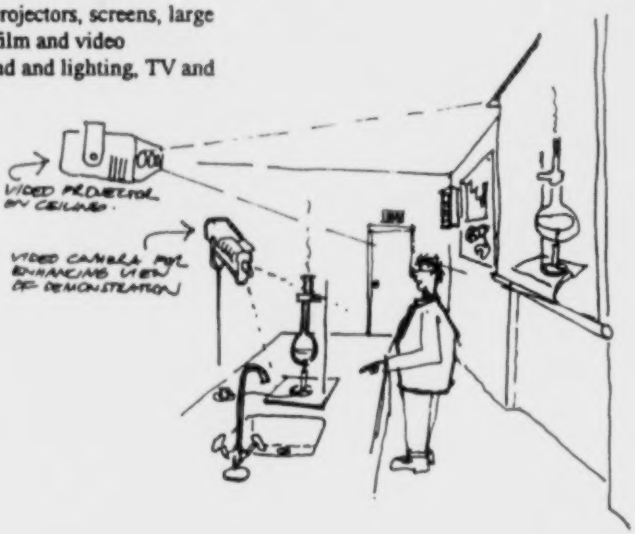
4.1. Lecture Spaces / Seminar Rooms

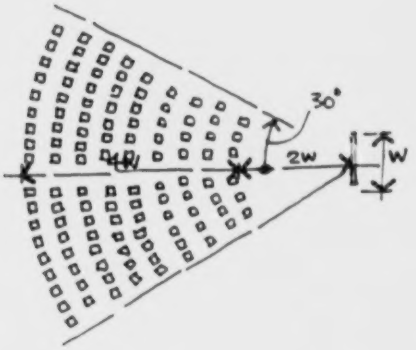
Formal lecture room facilities require an instructor, perhaps assisted by overhead projectors and other visual aids, and may include models or working experiments. This kind of space is most suitable for secondary and especially for senior secondary students where classes may be combined for particular sessions.

The characteristics of these spaces will be:

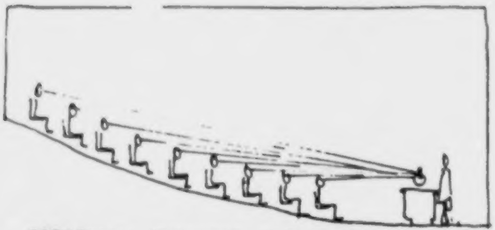
- Separate room with excellent acoustics, that has low reverberation, good voice projection and good visibility from all parts of the room.
- Seating may be fixed on a stepped or sloping floor, seats equipped with writing tablets. The accommodation will more than likely cater for multiple classes, given the cost of equipping such a space.
- The equipment will include overhead projectors, screens, large (multiple layer) chalk or whiteboards, film and video projection equipment, lectern with sound and lighting, TV and video control built-in.


ELECTRICALLY OPERATED CEILING MOUNTED SCREEN
MULTIPLE LAYER CHALKBOARD
CONTROL PANEL ON BENCH FOR LIGHTS, SCREEN, VIDEO/PA [illegible]


VIDEO PROJECTOR ON CEILING.
VIDEO CAMERA FOR ENHANCING VIEW OF DEMONSTRATION



SEATING GUIDELINES



CAREFULLY EVALUATE SITE LINES WHEN DETERMINING SLOPE OF FLOOR. DISTORTED SCALE FOR PURPOSE OF ILLUSTRATION.

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4.2. Classroom spaces

These are often referred to as General Purpose Learning Areas (GPLA). They will be required in schools for all grades.

The kinds of subjects taught in them will include English, Languages, Mathematics, Social Sciences, Sciences (not requiring significant equipment and/or experimentation) and most primary school subjects.

In Secondary Schools the rooms are characterised by:

- learning spaces equipped with desks, usually formally arranged,
- chalkboard/whiteboard
- audio-visual equipment, overhead projector and screen,
- display boards
- teacher's table and/or demonstration bench

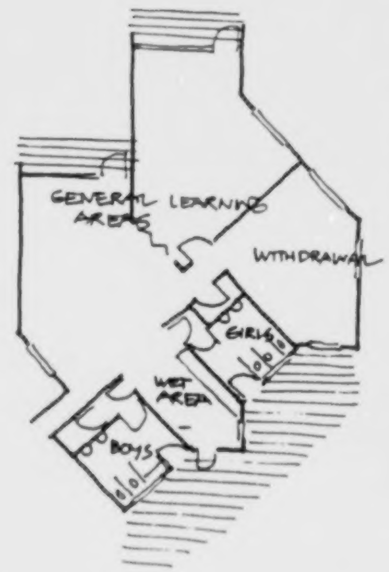
Included in this category, though separate to some degree are computer rooms for formal teaching of computing studies. Refer to section 7.1.1 for the characteristics of these spaces.

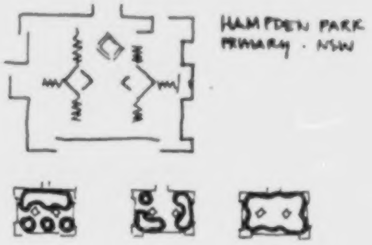
In Primary Schools these rooms are characterised by:

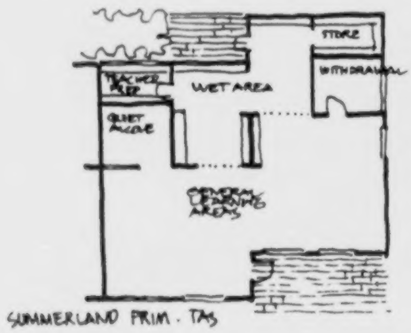
- Areas for desks, often informally arranged,
- informal spaces for reading and creative play (especially in junior classes),
- chalkboard/whiteboard
- large display areas,
- hanging space for art work completed in class
- audio visual equipment (overhead projector and screen, tape player
- in junior classes, a musical instrument, perhaps a piano or electronic keyboard
- shelving and storage (best if possible in dedicated adjacent store room),
- desk and resources storage for the teacher. (can be either in cupboards alongside desk, or better still in a small store room adjacent to the desk area which permits open storage shelves for instant retrieval of materials and resources)

Adjacent and in close proximity will usually be an entry foyer, coat and bag storage, wet areas for practical activities and withdrawal areas.

Withdrawal areas can be used for watching TV or video presentations, reading stories or perhaps special children enjoying additional help.







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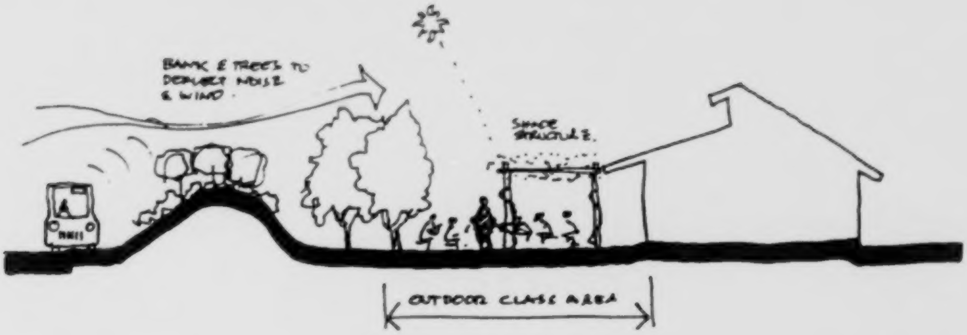
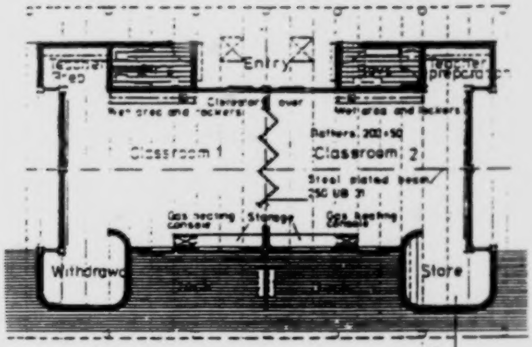
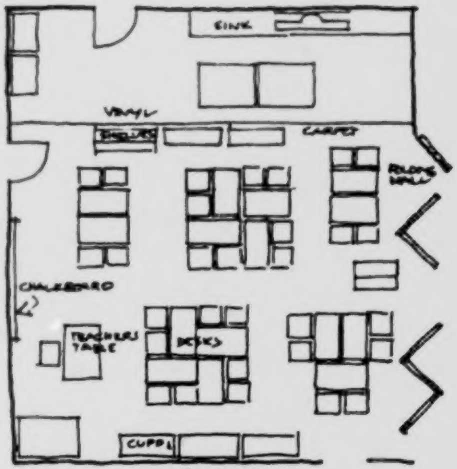
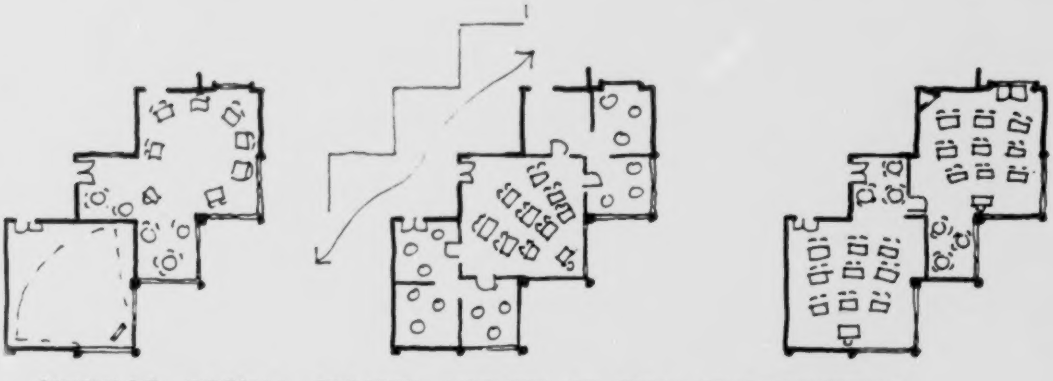

BANK & TREES TO DEFLECT NOISE & WIND.
SHADE STRUCTURE.
OUTDOOR CLASS AREA


Teacher prep
Entry
Teacher preparation
Clerestory over
Wet area and lockers
Wet area and lockers
Rafters 200×50
Classroom 1
Classroom 2
Steel plated beam 250 UB 31
Gas heating console
Storage
Gas heating console
Withdrawal
Store

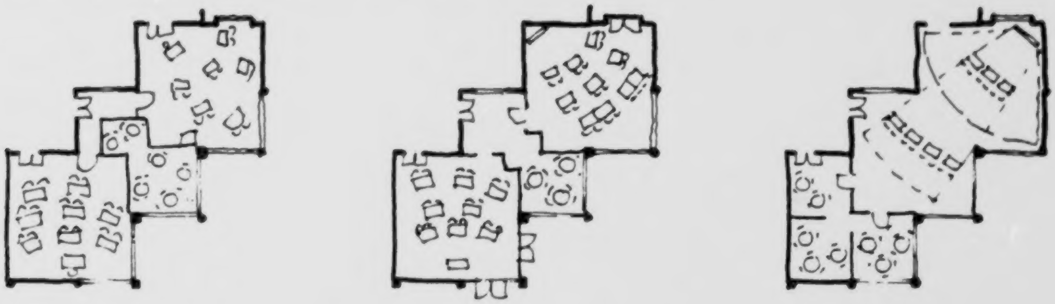
MTDISTRICT. PARENT-CHRISTIAN CONTROLLED SCHOOL VIC.


SINK
VINYL
SHELVES
CARPET
FOLDING WALL
CHALKBOARD
TEACHERS TABLE
DESKS
CUPBD

TYPICAL CLASSROOM
FROM NSW GOVERNMENT DESIGN STANDARDS.



MODULAR DESIGN PERMITS VARIETY OF ROOM CONFIGURATIONS
IF STRUCTURE IS INDEPENDENT OF WALLS. PERMITS ADAPTION TO NEW USES AS NEEDS CHANGE
FROM ARCHITECTURE D'AUJOURD'HUI MARCH 1957.



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4.3. Teaching and Practical Activities

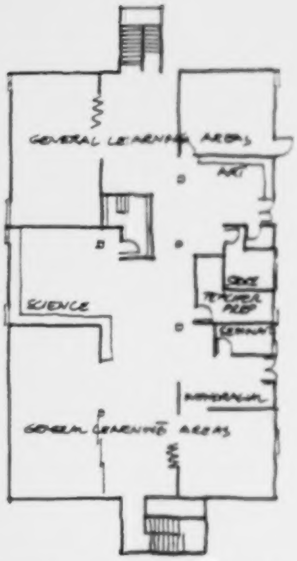
Special Purpose Learning Areas (SPLA) are used for classes in Science (Physics, Chemistry, Biology and Geology), Technology (wood, metal, plastics, textiles, design, food technology, technical drawing) and Art (painting and drawing, sculpture, photography). They predominate in secondary schools but also increasingly in primary schools. They will also be required where a Middle School (transition from Primary to Secondary) is being introduced.

In some schools where drama and/or music are given particular emphasis SPLA's may also be provided for Drama and Music in addition to what may be provided in a multi-purpose hall. Spaces for rehearsal, play readings and music practice are required for use by both individuals and groups of varying sizes. (Refer also 4.10)

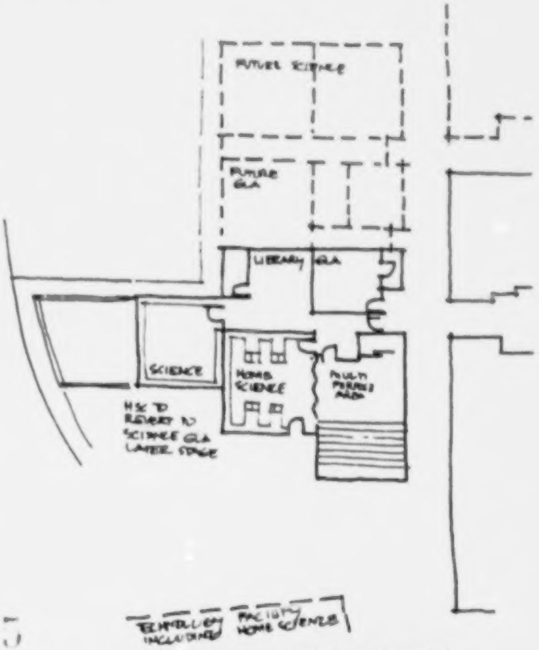
SPLAs are larger than normal classrooms to allow for freedom of movement, safety aspects (need space around special equipment and dangerous processes), special equipment, special finishes, additional services such as ventilation, electrical, water and gas services as well as drainage.

Furniture is generally purpose designed. The major activity is practical, requiring work at benches, machinery or laboratory equipment. Formal teaching, taking notes and holding discussions is a secondary activity and often best done in a more suitable space. Such spaces can be a part of a cluster of SPLA's.

Wall and floor finishes require special attention to withstand the additional wear and tear likely in these spaces.


GENERAL LEARNING AREAS
ART
STORE
TEACHER PREP
SCIENCE
SEMINAR
GENERAL LEARNING AREAS

COMBINED GENERAL LEARNING AREAS & PRACTICAL ACTIVITIES
MORIALTA HIGH SCHOOL . S.A


FUTURE SCIENCE
FUTURE GLA
LIBRARY
GLA
SCIENCE
HOME SCIENCE
MULTI PURPOSE AREA
HSC TO REVERT TO SCIENCE GLA LATER STAGE
TECHNOLOGY INCLUDING
FACILITY HOME SCIENCE

PLANNING FOR GROWTH INVOLVES CHANGED USES
CORNERSTONE COLLEGE MT BARKER SA
BROWN FALCONER . ARCHITECTS.

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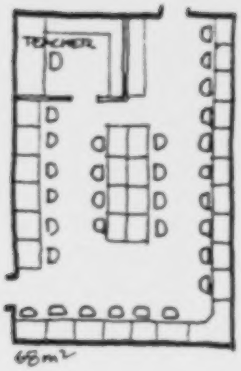
Examples of Special Purpose Learning Areas are:



Computer Rooms

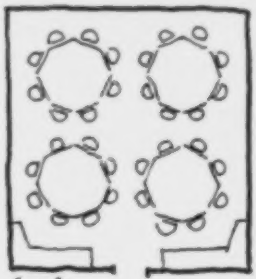
There are a number of ways in which rooms may be set up for computers:

- Computers set at the perimeter of the room
- Computers set on circular benches with the cabling at the centre - based on a design used at Billanook College, Mooralbark, Vic
- Computers on benches in a fish-bone pattern. The example below is from Mueller College, Redcliffe Qld adapted by Trevor Ginn from a design by Grace Lutheran College in Qld.

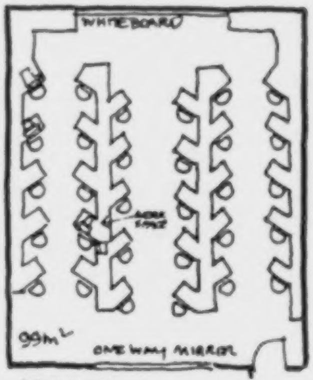
Before selecting the most appropriate design for use in your school consider the following:

- ease of installing and accessing the wiring
- potential for the teacher to oversee the work of majority of students
- efficiency in use of space
- work space immediately adjacent to computer for student materials - essential if students are to learn to relate their computer skills to other disciplines

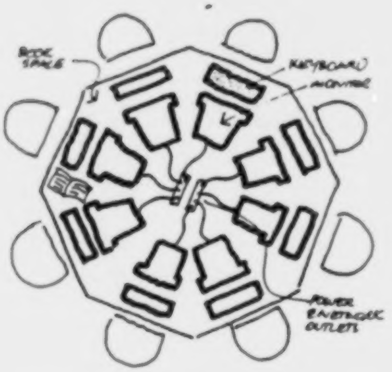
In an age of burgeoning technology and computers now in a large proportion of Australian homes the requirement for teaching the use of computers and for dedicated computer rooms may soon decline – allow for adaption to new uses of such spaces.



BILLANOOK COLLEGE



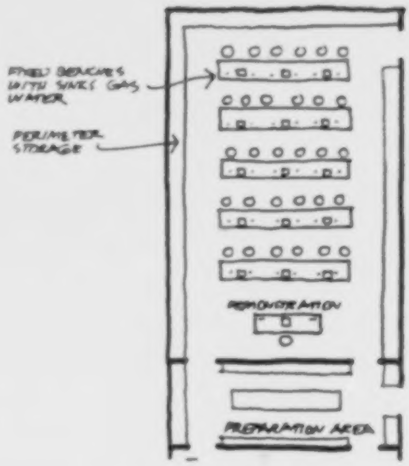
MUELLER COLLEGE



DETAIL PLAN OF TABLE · BILLANOOK COLLEGE

Science

A wide variety of configurations exists for Science facilities in schools, each with advantages and disadvantages to be evaluated within the particular context. The phase of growth of the school, kinds of science program being offered, need for making spaces available for alternative uses, etc. will figure in the evaluation. The various configurations include:



fixed workbenches across the room equipped with gas, water and drainage facilities

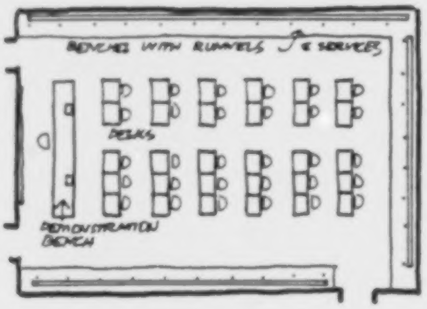
Advantage

- all students facing the teacher.

Disadvantages

- limited use for other classes
- expensive fitout and servicing
- awkward to clean
- limited access for staff in emergencies or for providing assistance.

This configuration is not used much today.



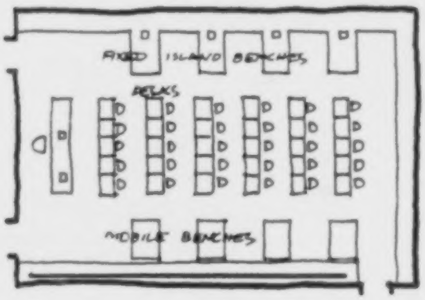
fixed benches around the room equipped either with runnels or sinks and writing tables and chairs in centre of room

Advantages

- experimental work is done separately from where books are used
- plumbing and other services are cheaper to install and service.

Disadvantages

- not easy to use for group work (however, not a significant disadvantage).



as preceding configuration but with island benches connected to perimeter benches

Advantage

- the island section is more conducive to group work

Disadvantage

- limited space at centre of room for non-science activity and/or non-experimental science work

as preceding configuration but with mobile benches at same height as perimeter benches

Advantages

- flexibility of space at centre of room for other activities

Disadvantages (not significant)

- potential damage to benches as they are being moved about
- accidents with volatile fluids if the mobile section is used for experimental work.

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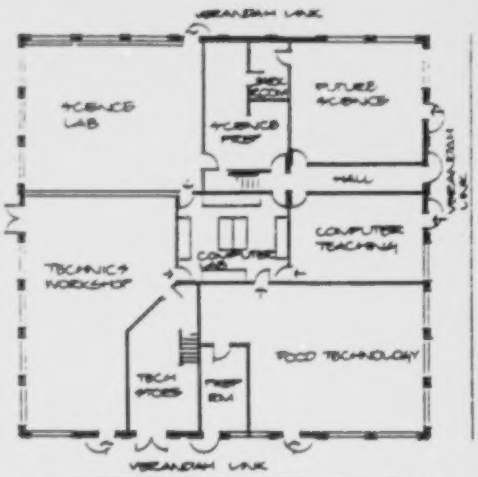
Technology

Heathdale Christian College, Werribee, Vic has a new technology wing comprising Home Economics, Computer facilities and Textiles in the one new block. It is a two-storey facility with GPLAs in the upper storey. The entrance lobby is a two storey structure with stair designed as a display space for student work. The entrance lobby's storefront-type show window also serves as a display space.

Beaconhills Christian College in Packenham Vic and Immanuel College, Novar Gardens, Adelaide SA both have excellent examples of technology teaching environments. The latter has a primary focus on computers in combination with advanced technology such as pneumatics, electronics and the study of a wide range of "high-tech" materials. The former is a more traditional approach but with an expanding variety of technologies available.

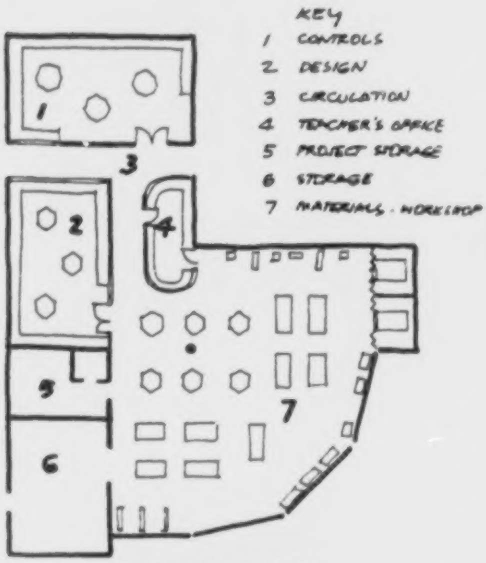
Some of the key requirements are:

- a workshop environment
- good supervision potential of all spaces
- access by students to the widest possible range of technologies during set class times (in order to explore the vast potential available)
- capacity for integration of design, construction and testing of articles using the computers as part of this process.
- excellent storage
- access for loading and unloading heavy articles such as machinery
- good ventilation and light
- safe, hard-wearing non-slip floor finishes

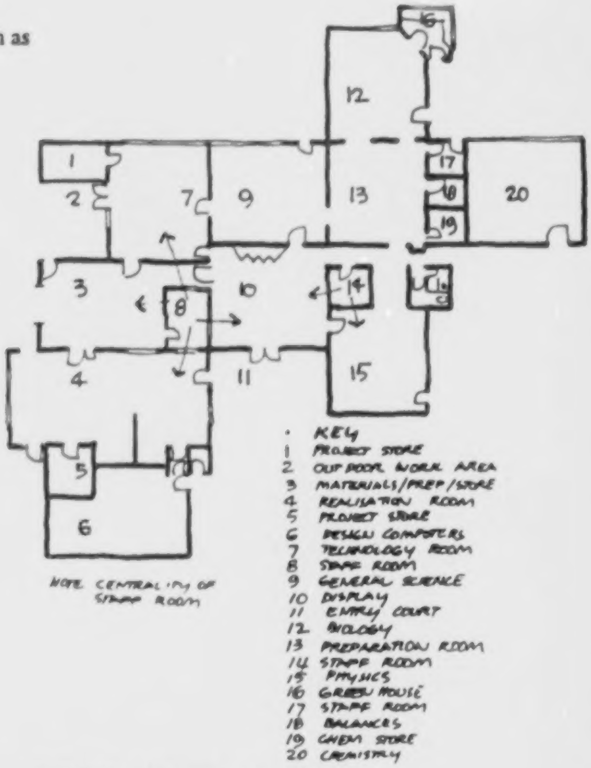

VERANDAH LINK
SCIENCE LAB
SICK ROOM
FUTURE SCIENCE
SCIENCE PREP
HALL
VERANDAH LINK
TECHNICS WORKSHOP
COMPUTER LAB
COMPUTER TEACHING
TECH STORES
PREP RM
FOOD TECHNOLOGY
VERANDAH LINK

TECHNOLOGY BUILDING
PENRITH CHRISTIAN COMMUNITY SCHOOL
STANTON DAHL ARCHITECTS

TECHNOLOGY BUILDING
With the greater degree of integration and interaction between specialist subjects and with the increasingly important role that computers play, a building that enables all of these functions to be close together is of value. The computer lab is available as an extension of the specialist room while a computer teaching area is kept as a separate space


KEY
1 CONTROLS
2 DESIGN
3 CIRCULATION
4 TEACHER'S OFFICE
5 PROJECT STORAGE
6 STORAGE
7 MATERIALS - WORKSHOP
1
2
3
4
5
6
7

IMMANUEL COLLEGE
TECHNOLOGY CENTRE
ADELAIDE . S.A
GEOF NAIRN . ARCHITECTS


16
12
1
2
7
9
13
17
18
19
20
3
8
10
14
16
4
11
15
5
6
KEY
1 PROJECT STORE
2 OUTDOOR WORK AREA
3 MATERIALS/PREP/STORE
4 REALISATION ROOM
5 PROJECT STORE
6 DESIGN COMPUTERS
7 TECHNOLOGY ROOM
8 STAFF ROOM
9 GENERAL SCIENCE
10 DISPLAY
11 ENTRY COURT
12 BIOLOGY
13 PREPARATION ROOM
14 STAFF ROOM
15 PHYSICS
16 GREEN HOUSE
17 STAFF ROOM
18 BALANCES
19 CHEM STORE
20 CHEMISTRY

NOTE CENTRALITY OF STAFF ROOM

SCIENCE & TECHNOLOGY CENTRE
BEACONHILLS CHRISTIAN COLLEGE .
PACKENHAM . VIC
PETER G LYALL & ASSOC ARCHITECTS

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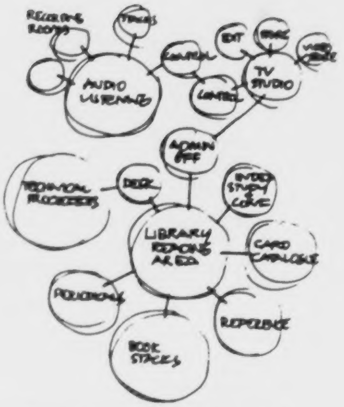

RECORDING ROOMS
TRACKS
EDIT
VIDEO CENTRE
CONTROL
TV STUDIO
AUDIO LISTENING
CONTROL
ADMIN OFF
TECHNICAL PROCESSES
DESK
INDEP STUDY & CONF
LIBRARY READING AREA
CARD CATALOGUE
PERIODICALS
REFERENCE
BOOK STACKS

SPATIAL RELATIONSHIPS
LEARNING RESOURCES
COUNCIL OF EDUCATIONAL FACILITY PLANNERS
EG. SPACES FOR LEARNING
GUIDE FOR EDUCATIONAL
PLANNERS.

4.4. Student research and study spaces

Included in this category are libraries, student study spaces and areas for student research. The primary concern is to provide comprehensive resource materials for student reference purposes in a quiet environment that encourages individual study, creative thinking and quiet reflection.

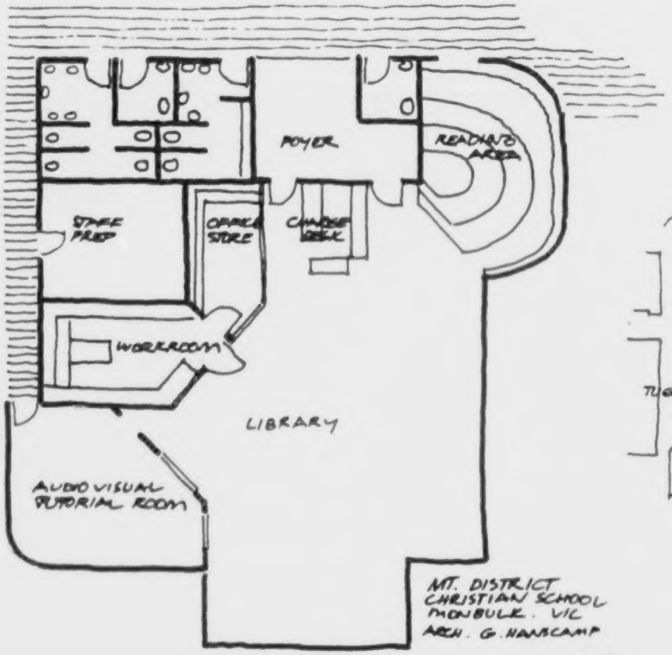
Space is required for reference books, CD-rom and other computer formats, as well as for audio-visual resources.

Ancillary spaces will include audio-visual room(s), a work room for sorting and repairing books, a library staff room and an entry foyer.

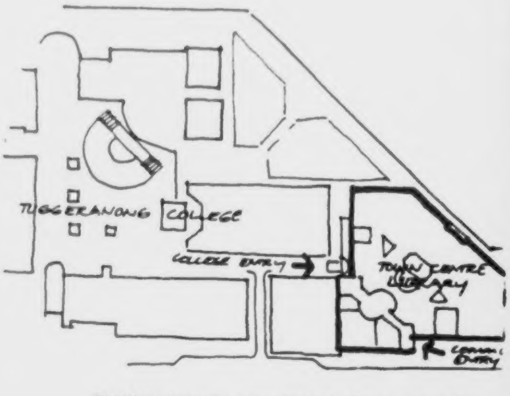
Seating arrangements will allow for individual activity and small group discussion with occasional teacher-led discussions and briefing, though this is sometimes provided for in separate adjacent spaces such as seminar rooms.

These facilities are often referred to Resource Centres as the concept of "Library" is not adequate to describe the wide range of information handling, access and storage now becoming commonplace.

This category of space is one where the community can be advantaged by allowing after hours access to parents, other adults as well as the students of the school. This raises a number of security issues that must be addressed but given the generally isolated nature of the resource these are relatively easily addressed provided staff are available.


FOYER
READING AREA
STAFF PREP
OFFICE STORE
CHARGE DESK
WORKROOM
LIBRARY
AUDIO VISUAL TUTORIAL ROOM

MT. DISTRICT
CHRISTIAN SCHOOL
MONBULK . VIC
ARCH. G. HANSCAMP


TUGGERANONG COLLEGE
COLLEGE ENTRY
TOWN CENTRE LIBRARY
COMM. ENTRY

TUGGERANONG COLLEGE & TOWN LIBRARY
ARCHITECTS
EDWARDS, MADIGAN, TORZILLO & BRIGGS

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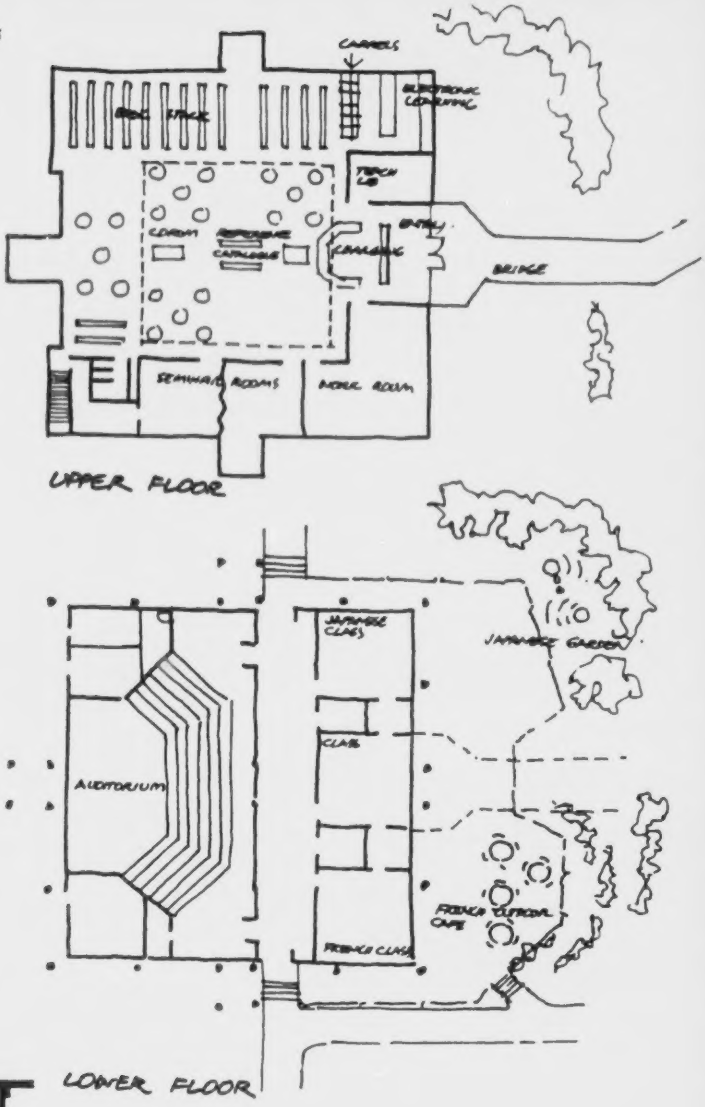
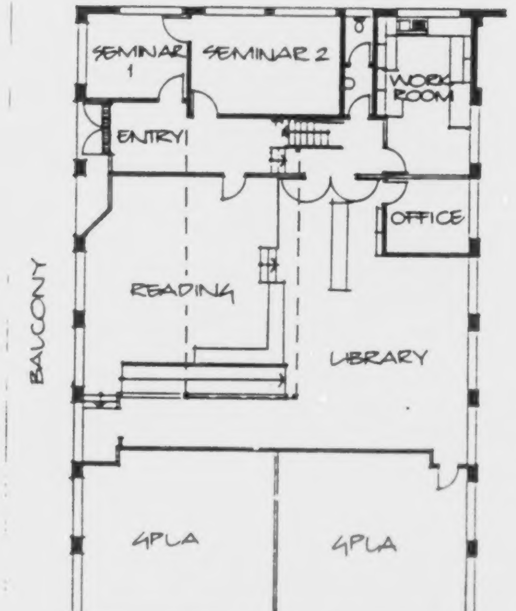

CARRELS
BOOK STACK
ELECTRONIC LEARNING
FORUM
REFERENCE
CATALOGUE
CHARGING
ENTRY
BRIDGE
SEMINAR ROOMS
WORK ROOM
UPPER FLOOR
JAPANESE CLASS
JAPANESE GARDEN
AUDITORIUM
CLASS
FRENCH OUTDOOR CAFE
FRENCH CLASS
LOWER FLOOR

MORETON BAY COLLEGE
MANLY · BRISBANE
DON RODERICK · ARCHITECT


SEMINAR 1
SEMINAR 2
WORK ROOM
ENTRY
OFFICE
READING
LIBRARY
BALCONY
4PLA
4PLA
BALCONY

Library
Library facilities need to be capable of growing in line with the growth of the School itself. Class room spaces can be planned into a library block with this space being capable of absorption into the library in the future.

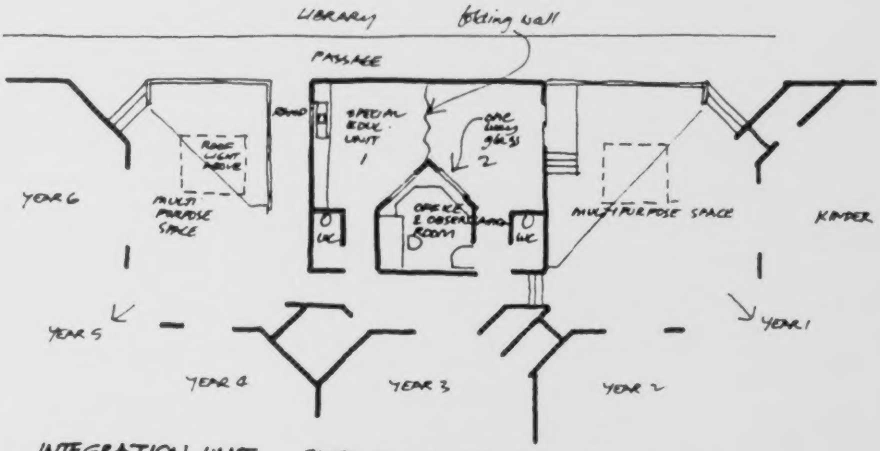
LIBRARY BUILDING
PENRITH CHRISTIAN
COMMUNITY SCHOOL
Stanton Dahl Architects

4.5. Special Students Learning Areas

In designing schools planners need to be aware of the need to provide for a diverse range of learners in todays schools. These include students with learning difficulties, students requiring English as a Second Language (ESL) instruction, students with disabilities and students undertaking subjects requiring small group discussion or a withdrawal situation. The implications for school design include:

- diversity of spaces for smaller group or individual learning
- increased demand for staff facilities where additional specialist staff are employed
- the need to satisfy legal requirements with respect to the provision of at least ground floor wheelchair access and toilet facilities for people with disabilities
- greater capacity for storage of resources, particularly if the range of abilities is great.
- space for manoeuvring wheelchairs, frames, crutches or other such aids
- special furniture to accommodate the increased range of physical abilities, disabilities or limitations
- switches, power outlets, door handles, shelves within reach of disabled students
- spaces for counselling/advising parents – these may in fact be located alongside the class areas with one-way vision panels to permit parents to observe the teaching process.

Door widths of normal size are usually sufficient for wheel chair access, but it may be useful to add a small leaf that can be opened in special circumstances.

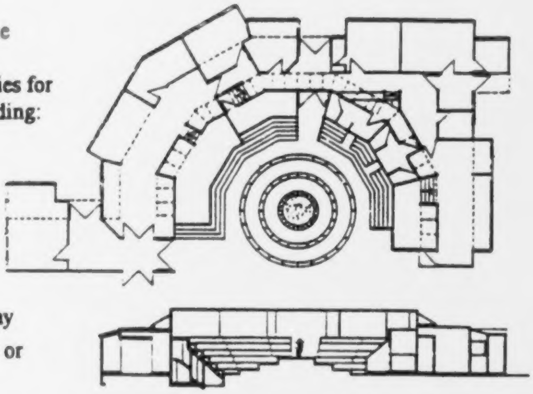

LIBRARY
folding wall
PASSAGE
ROOF LIGHT ABOVE
SPECIAL EDUC. UNIT
1
one way glass
2
OFFICE & OBSERVATION ROOM
WC
WC
YEAR 6
MULTI PURPOSE SPACE
MULTIPURPOSE SPACE
KINDER
YEAR 5
YEAR 1
YEAR 4
YEAR 3
YEAR 2

INTEGRATION UNIT. PACIFIC HILLS CHRISTIAN SCHOOL · DURAL · NSW
NOEL BELL RIDLEY SMITH ARCHITECTS

4.6. Students recreational spaces

Recreation areas should be designed to provide contrast to the formal teaching areas and a genuine sense of relief and "re-creation". Recreational spaces comprise fields and facilities for sport and playgrounds, as well as rest and lunch areas, including:

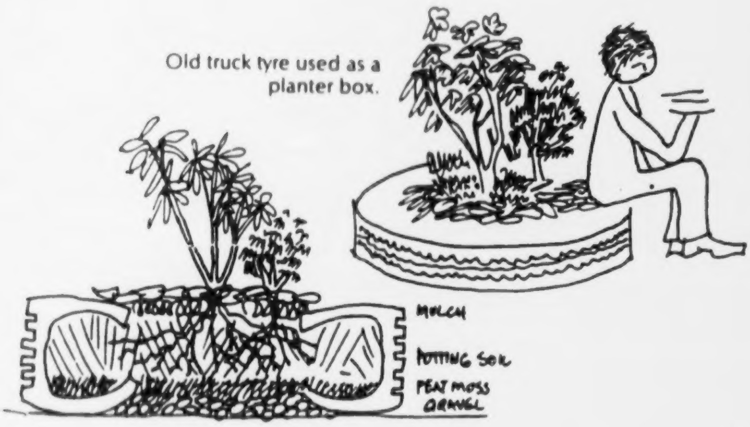
- games courts and fields
- athletics tracks and fields
- indoor courts
- gymnastics equipment
- swimming pools
- areas equipped with climbing equipment for creative play
- informal seating arrangements for meal or snack breaks or discussions away from classrooms
- large open areas some paved, some grassed
- shade areas



KENA KENA PRIMARY SCHOOL N.Z.
PEB EXCHANGE · OECD · OCT '88 No 6.

Significant variations will exist across the wide spectrum of recreational requirements due to prevailing weather conditions, age of students, land availability and resources available for development of school facilities.

Among the most important characteristics of these spaces is the ease and efficiency of student supervision. Many different areas separated by walls, screens or planting make supervision difficult. Planners should give careful consideration to efficient supervision with the minimum staff time and expense.



Old truck tyre used as a planter box.

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4.7. Staff studies

Schools must devote significant time to carefully planning the staff study areas. These spaces are needed for preparing lessons and for marking homework, examinations and assignments – essential in primary and especially secondary schools. These spaces may also be used at times by groups of teachers working on curriculum development projects, and as such may be required for days at a time.

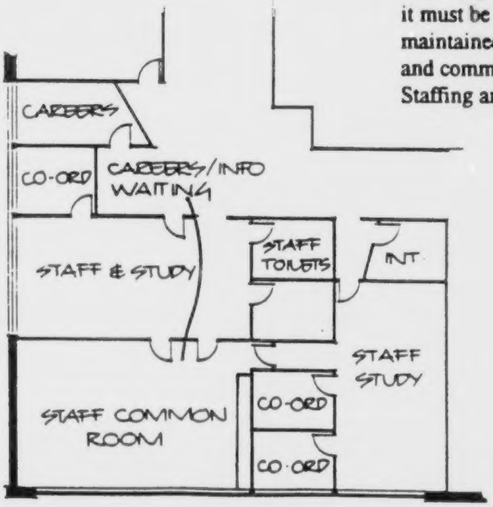
The most important characteristics of these spaces are centrality and accessibility to student areas, privacy, adequate work areas, accessibility to resources as well as to administration areas. Often the staff room is the hub of the school.

The study area should be well-equipped, roomy, comfortable and conducive to preparing lessons. If staff are provided with administrative or secretarial support then proximity to school administration areas is important.

Staff study areas will also require:

- access to photocopiers and computer facilities
- pinboard for staff notices
- pigeon holes (if not in staff common room)
- desks of sufficient size for study materials, computer and books
- quality ergonomically designed chairs
- adequate storage for lesson materials and teaching tools
- power for electronic equipment including computer – note if computers are to be standard equipment at each desk larger spaces will be required
- data outlet for connection to school local area network (LAN) and data-base and printers
- adequate screening and acoustic barriers to sustain a quiet study environment.

The study area may be adjacent to the staff common room however, it must be arranged so that a quiet environment for preparation is maintained. There are a number of ways to arrange staff studies and common rooms. For further information, see section 3.3 Staffing arrangement.



STAFF AREAS
Stanton Dahl Architects

Staff Areas
It is possible to group staff facilities into one area. Staff study areas (with co-ordinator officers) can be grouped around staff common rooms. Interview rooms can also be located in this vicinity to enable staff to have interviews with students or parents.

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4.8. Staff recreational area - common rooms

The staff common room is a place of retreat and refreshment as well as the most probable place for staff meetings and for parents activities after school hours.

The space should be open, comfortable, well-lit and ventilated, and, if needed, equipped with air-conditioning to enhance the sense of relief for staff.

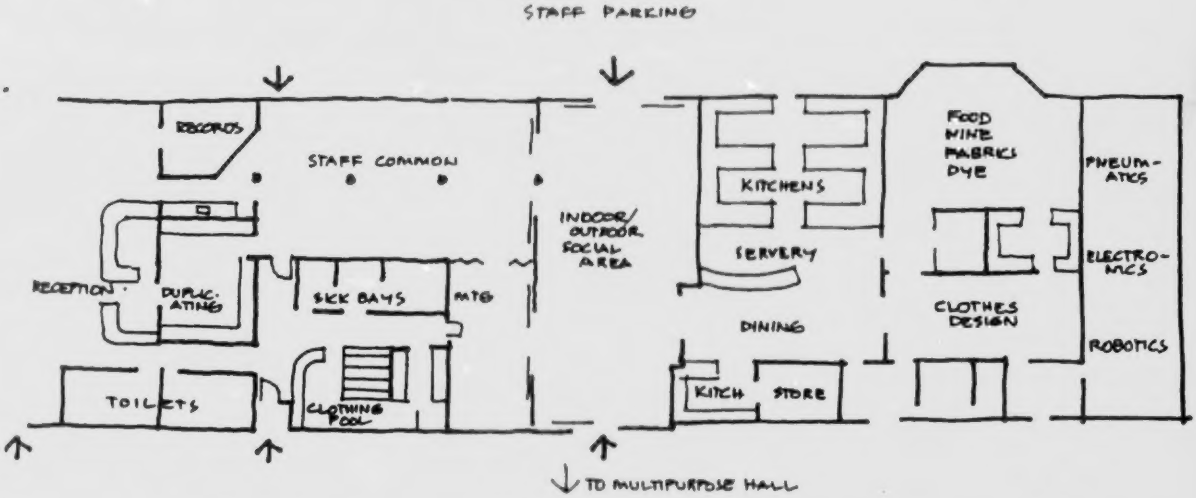
The common room or the staff study should include the staff mail boxes or pigeon holes. For this reason ready access to the school administration area is desirable.

Such spaces can often serve other uses as well. For example:

- staff/parent meetings
- staff training
- celebratory functions - staff farewells
- senior student - staff functions
- community discussions/information gathering and dissemination

These uses suggest the following equipment

- tables and chairs for dining
- easy chairs
- visual aid equipment, overhead projector, video player/projector
- white board
- display boards


STAFF PARKING
RECORDS
STAFF COMMON
RECEPTION
DUPLIC-ATING
SICK BAYS
MTG
TOILETS
CLOTHING POOL
INDOOR/ OUTDOOR SOCIAL AREA
KITCHENS
SERVERY
DINING
KITCH
STORE
FOOD WINE FABRICS DYE
CLOTHES DESIGN
PNEUM-ATICS
ELECTRO-NICS
ROBOTICS
TO MULTIPURPOSE HALL

STAFF COMMON ROOM - FAITH LUTHERAN SCHOOL - TANUNDA, SA
Note that the staff common room benefits from proximity to admin, food areas, duplicating, meeting room, all of which can be utilised for other out-of-hours functions, for which the school is highly regarded - a centre for learning and offering hospitality.

Architect - Geoff Nairn Architects.

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4.9. Service spaces, toilets, canteens, stores, maintenance

A school will comprise significant service areas. Some services spaces are required by law under basic health and safety requirements (toilets and washrooms). Others are required to house power distribution equipment (switch boards and meters) and air-conditioning equipment. Yet others will be determined by teaching strategies - stores for teaching aids and equipment.

The characteristics will very much reflect the utilitarian nature of the spaces and will vary according to need and function. It is particularly important that floor and wall surfaces (especially) in these areas are durable in nature.

Storage requirements

Storage requirements are often underestimated. Clear access and good visibility of all parts of storage areas help to maintain control of stored resources.

Included among the storage requirements and often overlooked in new schools is the need to provide adequately for archiving of important records. Archives will include:

- financial and general administrative records (need to be kept for 7 years minimum, unless signed under seal in which case storage up to 20 years may required).
- student records, which need to be kept for a sustained period - the courts may require records for up to 7 years,
- historical records, memorabilia

Convenient access to washroom facilities

Particularly in infants and primary schools, access to toilets from play and teaching areas allows monitoring of children and minimises risks from harm by strangers.

Space requirements for maintenance services

Buildings that are well maintained generally have adequate space for workshop and storage for maintenance equipment and materials. Adequate space is also required for efficient servicing of equipment. Cramped conditions hamper and discourage proper servicing. Accommodation for staff change areas, showers and toilets as well as lunch rooms is essential. Planners should therefore avoid the temptation to economise on space allocation to service areas.

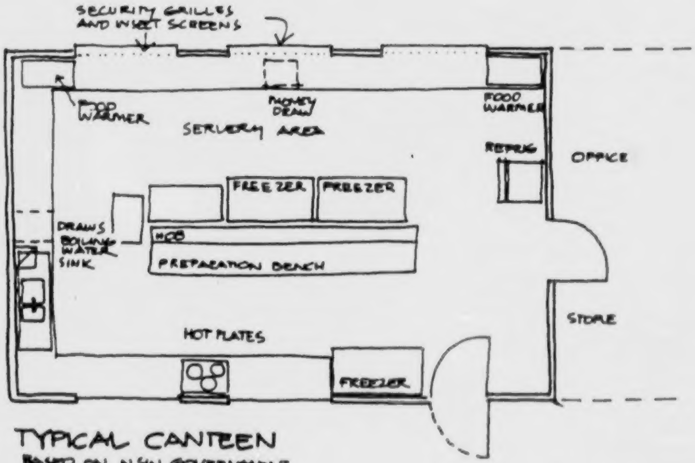
The location requires direct access to roads for deliveries, playing fields for maintenance equipment and to all other facilities for wheeled access. Some schools use a mini-tractor with trailer to transport tools and materials - design access with this in mind.

Maintenance facilities should be large enough for storage of tractors, ladders, furniture in for repair, large sheet materials and may even include a small hoist for lifting materials off trucks. Vehicle access into maintenance areas should be provided.

Canteen

Characteristics of canteens will vary but the following will provide at least a basis for discussion. It would be useful to draw on the experience of parents or other people who have had experience in establishing such a facility in other schools. Have a small working party visit other situations. Some important features are:

- direct access to places where students assemble/play
- convenient access to multi-purpose hall if canteen to serve that facility as well (given the cost of establishing, this should be given consideration)
- convenient and safe access to service vehicles for deliveries and removal of refuse
- floors which are easy to clean and are comfortable and safe to walk and stand on for sustained periods
- storage which is either open for easy cleaning and/or capable of being sealed against vermin
- adequate power for all potential equipment
- sinks for washing utensils and food
- separate basin for handwashing
- storage of clothes and personal belongings and change area
- preparation benches
- storage area for goods received and unpacking
- telephone with connection to school network
- security facilities given nature of goods stored
- secure cash handling facility - cash register
- provide for clear view outside before staff have to emerge (if handling large amounts of cash)


SECURITY GRILLES AND INSECT SCREENS
FOOD WARMER
MONEY DRAW
FOOD WARMER
SERVERY AREA
REFRIG
OFFICE
FREEZER
FREEZER
DRAWS
BOILING WATER
SINK
HOB
PREPARATION BENCH
STORE
HOT PLATES
FREEZER

TYPICAL CANTEEN
BASED ON NSW GOVERNMENT SCHOOL DESIGN STANDARD

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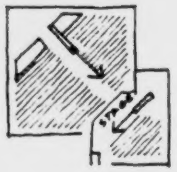
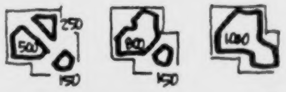
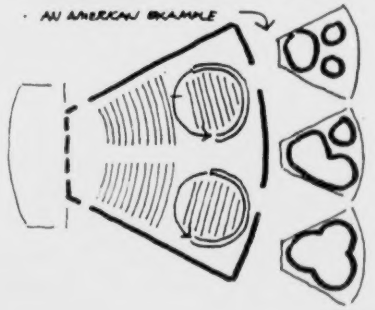



250
500
150
800
150
1000

FLEXIBLE HALL
· THE ENTRANCE HIGH SCHOOL NSW
· AN AMERICAN EXAMPLE



4.10. Assembly spaces, both indoor and outdoor

The need for spaces for the whole school community to gather together will depend on the availability of suitable venues in the community.

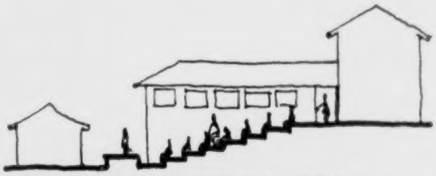
Community halls can provide for school activities involving students and staff as well as parents and friends. The more regular school activities such as school assemblies need a more readily accessible venue. For small schools this can be in the form of adjoining rooms with moveable walls between them or a large outdoor space sufficiently protected from the elements.

The expansion in curriculum offerings, including extra-curricular activities, together with the need for schools to provide meeting places for parents and for community activities, has made the need for multi-purpose halls an essential part of both primary and secondary schooling. They provide venues for::

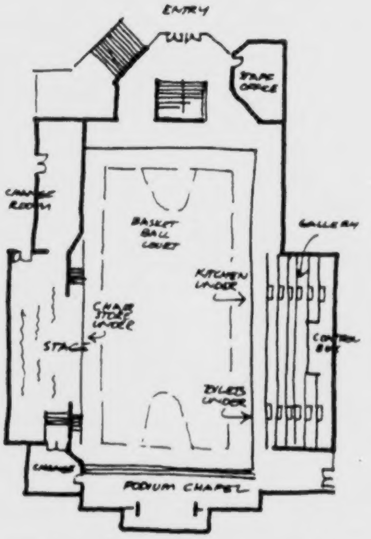
- drama and dance
- gymnastics
- choral and orchestral music
- indoor team sports (basketball)
- community activities
- school presentations and functions

The characteristics of an assembly space to serve these needs are:

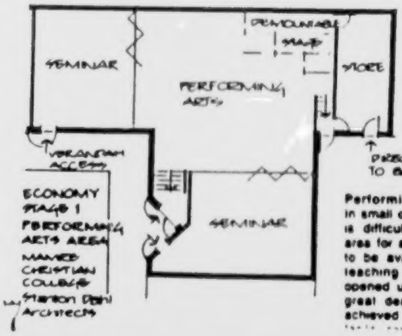
- flat floor, preferably sprung to absorb impact
- a multi-purpose stage with proscenium
- walls which resist damage but which also keep reverberation within acceptable limits
- lighting suitable for drama but also protected from ball impact
- substantial storage areas for chairs
- furniture which will not damage floor surface including the markings for games
- adjacent food service area (could be school canteen)
- toilets and showers (could be general school facilities)
- close proximity to road and entries for convenient after-hours access and for delivery of stage props and heavy musical instruments such as pianos
- adjacent, large, covered areas for gathering of crowd before and after presentations



EXTERNAL ASSEMBLY SPACE
TAKING ADVANTAGE OF EXISTING SLOPE


ENTRY
STAFF OFFICE
CHANGE ROOM
BASKET BALL COURT
GALLERY
KITCHEN UNDER
CHAIR STORE UNDER
STAGE
CONTROL BOX
TOILETS UNDER
CHANGE
PODIUM CHAPEL

MULTIPURPOSE HALL CONCEPT
BASED ON DESIGN FOR
ROSEVILLE COLLEGE, ROSEVILLE NSW
JOHN CARR ARCHITECTS, TAMWORTH NSW


SEMINAR
DEMOUNTABLE
STAGE
STORE
PERFORMING ARTS
VERANDAH ACCESS
SEMINAR
DIRECT ACCESS TO BACK STAGE

ECONOMY
STAGE 1
PERFORMING
ARTS AREA
MANNED
CHRISTIAN
COLLEGE
Stanton Dahl
Architects

Performing Arts Area
In small or developing schools, it is difficult to provide sufficient area for a performing arts facility to be available. By combining teaching spaces that can be opened up to a larger space, a great deal of flexibility can be achieved and a more permanent

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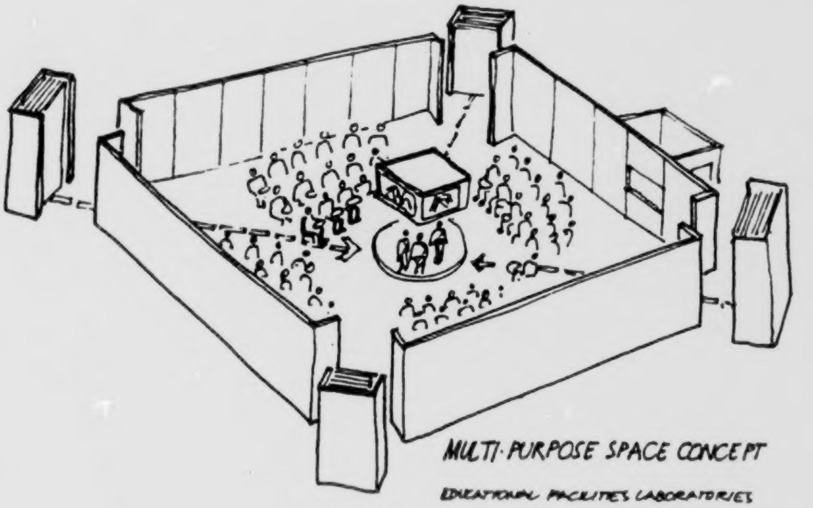
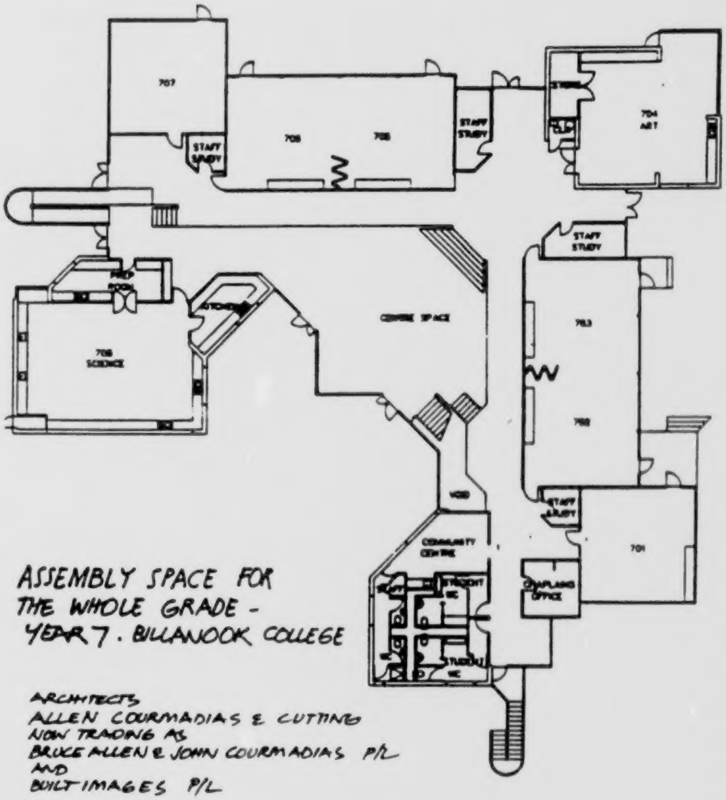


MULTI·PURPOSE SPACE CONCEPT

EDUCATIONAL FACILITIES LABORATORIES


707
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STAFF STUDY
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PREP ROOM
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SCIENCE
CENTRE SPACE
703
702
VOID
STAFF STUDY
COMMUNITY CENTRE
STUDENT WC
CHAPLAINS OFFICE
STUDENT WC
701

ASSEMBLY SPACE FOR
THE WHOLE GRADE -
YEAR 7. BILLANOOK COLLEGE

ARCHITECTS
ALLEN COURMADIAS & CUTTING
NOW TRADING AS
BRUCE ALLEN & JOHN COURMADIAS P/L
AND
BUILT IMAGES P/L

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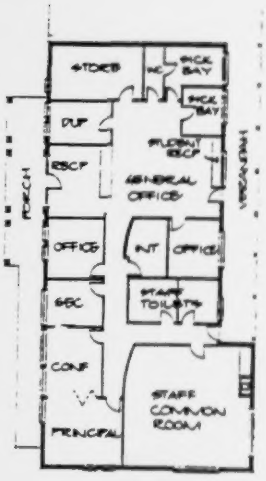

STORE
WC
SICK BAY
SICK BAY
DUP
STUDENT RECP
RECP
GENERAL OFFICE
PORCH
VERANDAH
OFFICE
INT
OFFICE
SEC
STAFF TOILETS
CONF
STAFF COMMON ROOM
PRINCIPAL

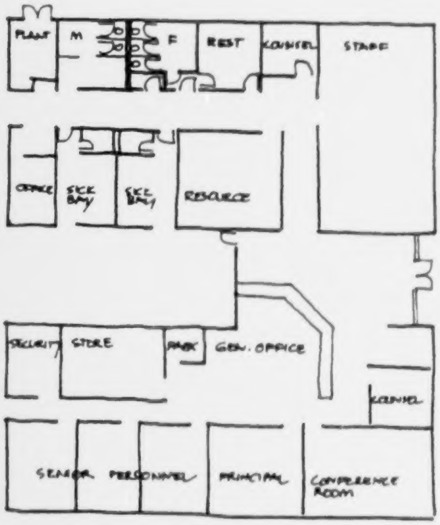
ADMINISTRATION BLOCK
GREEN POINT BAPTIST
CHRISTIAN COMMUNITY
SCHOOL
Stanton Dahl Architects

4.11. School Administration

The school administration areas provide for the Principal and Bursar or Business Manager and their staff. This area is most likely to contain the sick bay(s), secure store for files and records, interview rooms, photocopy areas and school stationery and book stores. Visitors will come to this area first, hence it should be adjacent to the school's main entrance.

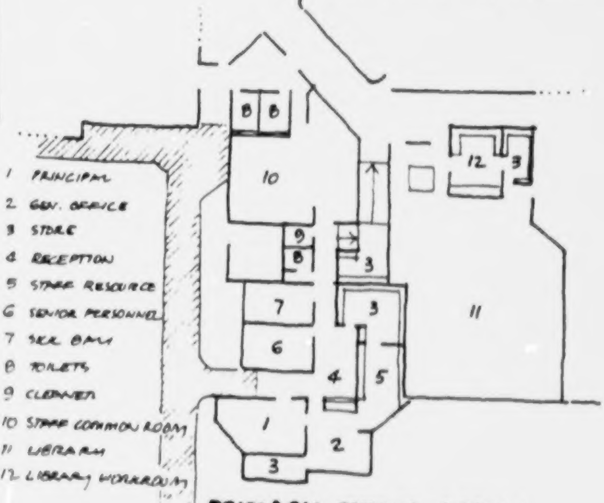
The facility will be characterised mostly as office accommodation with visitors' reception and display areas - it will often be the showcase of the school. The visitors' area will contain a lounge for parents and others waiting for interviews - some degree of privacy may be appropriate. Due to the nature of the area, the quality of the finishes and furniture will reflect a softer, more welcoming approach to interior design than those in student areas.

Because it is the one area occupied by staff consistently throughout the day and because of its proximity to entrance and road, it is usually a convenient area for receipt of goods - hence the need for an adjacent, large dock/store for sorting and distribution.


PLANT
M
F
REST
COUNSEL
STAFF
OFFICE
SICK BAY
SICK BAY
RESOURCE
SECURITY
STORE
PABX
GEN. OFFICE
COUNSEL
SENIOR
PERSONNEL
PRINCIPAL
CONFERENCE ROOM

SECONDARY SCHOOL ADMIN
MT ELIZA HIGH SCHOOL · VICTORIA

Admin Building
Admin facilities need to be flexible and cover a range of requirements. Staff common rooms are often located in an admin facility and thus the building becomes the hub of the School both from an administrative and staff perspective. There needs to be appropriate accommodation for staff and student needs, including store rooms, duplicating areas, interview rooms etc. It is desirable that the general office be arranged so that student access and visitor access can be kept separate.


1 PRINCIPAL
2 GEN. OFFICE
3 STORE
4 RECEPTION
5 STAFF RESOURCE
6 SENIOR PERSONNEL
7 SICK BAY
8 TOILETS
9 CLEANER
10 STAFF COMMON ROOM
11 LIBRARY
12 LIBRARY WORKROOM

PRIMARY SCHOOL ADMIN
WOORI YALLOCK PRIMARY SCHOOL
CLARKE HOPKINS AND CLARKE · ARCHITECTS

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4.12. Access ways and student storage (lockers)

Access to school buildings by students is best kept separate from visitor areas and main entrances. Student entrances need to be close to school bus terminals. School policies should state whether students may access buildings prior to class time; this will have an impact on design of entrances.

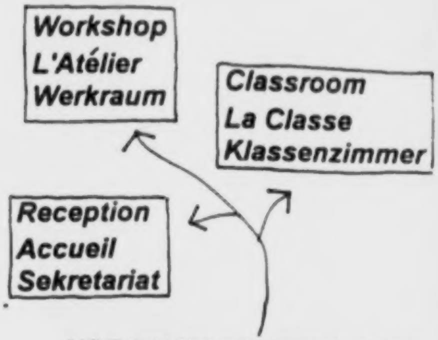
Access ways should lead easily and directly to places where school bags are stored, and then to play areas. The access ways linking the various spaces should include:

- sufficient width to allow whole class groups to pass each other
- wall and floor finish to resist the significant wear and tear of student traffic
- clear signage and safe and direct access to exits in case of emergency
- space for student storage - passageways are a convenient location for lockers since students can access them while moving from one class to another
- adequate lighting and ventilation
- display facilities - corridors provide a good venue to display student work, given adequate protection.

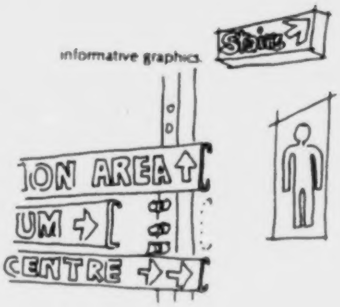
In climates where air-conditioning is required, enclosed corridors, which retain the cooled or heated hair, are more energy efficient than open access ways.

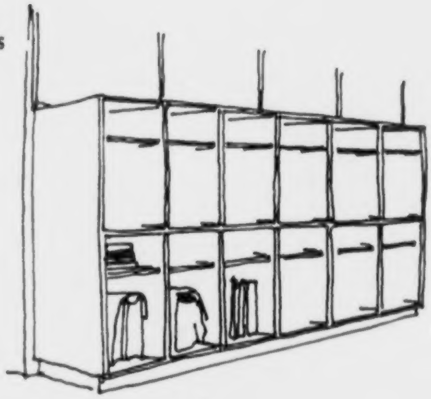
Impact of school layout on time between classes

If classrooms are spread around the site, the time increases for students and staff to move from one room to the next. Delays will be exacerbated if books, visual aids and equipment also need to be transported long distances. Supervision of students also becomes more difficult. Planners should therefore consider a school design with efficient access ways and minimal distances between classes. In large schools the problem can be solved by clustering classrooms and staff rooms in coordinated groups. See section 3.3 for the advantages and disadvantages of the various groupings and arrangements.



USE SIGNS TO REINFORCE LANGUAGES BEING TAUGHT IN THE SCHOOL



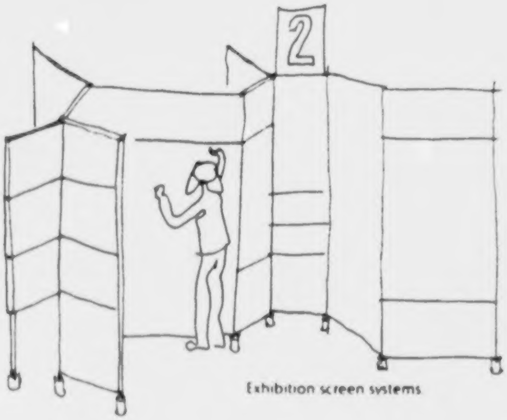


OPEN LOCKERS

In some secondary school environments open lockers provide adequate storage for students materials.

These provide opportunity for teaching discipline, reponsibility and mutual care as well as assisting in monitoring storage habits more easily.

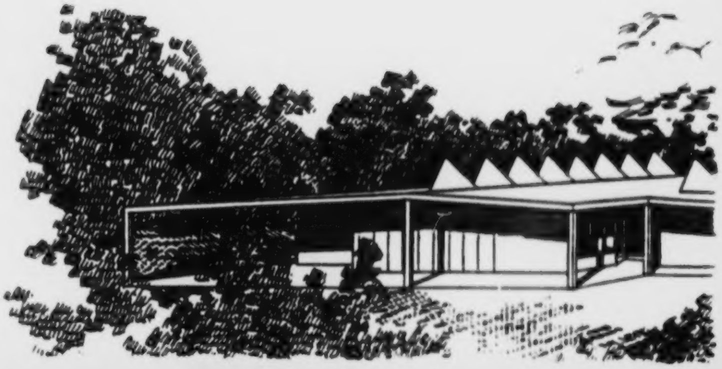
Open lockers are provided at two Lutheran schools in SA, Faith Lutheran at Tanunda and Cornerstone College at Mt Barker.



Exhibition screen systems

4.13. Caretaker and Staff Accommodation

On-site accommodation, if required, for caretaker and/or security staff is best located at points where maximum visibility of access points is available. At the same time the need for some privacy should be taken into account.



School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

CONSTRUCTION METHODS AND MATERIALS

5

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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1 Introduction and Chapter 1 – Developing a Master Plan
2 Chapter 2 – Making the Most of Your School Site
3 Chapter 3 – Principles of Good School Building Design
4 Chapter 4 – Purpose Designed Facilities
5 Chapter 5 – Construction Methods and Materials
6 Chapter 6 – Managing the Construction Process
7 Chapters 7 and 8 – Technology and Managing Buildings
8 Appendices

ISBN 0 646 23758 6 refers to the complete set of 8 booklets

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

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5

Construction Methods and Materials

5. Construction Methods and Materials

The aim of this chapter is to assist the planning team in understanding the various types of construction that may be used, the materials available and some elementary aspects of the services required in a school building. The term "services" refers to the systems of the building, such as energy for power and light, ventilation and air-conditioning, water, sewerage and security. The sections covered are:

- Construction methods (5.1)
- Choice of materials (5.2)
- Building services and systems (5.3)

Relevance to Master Planning Team

While most of the above decisions will be largely the responsibility of the professional consultants (architects and engineers) the Master Planning Team should have a basic understanding of the range of decisions to be made.

Choice of construction method, materials and services needs to be considered in the light of function and economy (however the cheapest solution is not necessarily the most economical in the long run). Different solutions will suit different environments.

> *....understanding various types of construction, the suitability of various material and building services.....*

5.1. Construction Methods

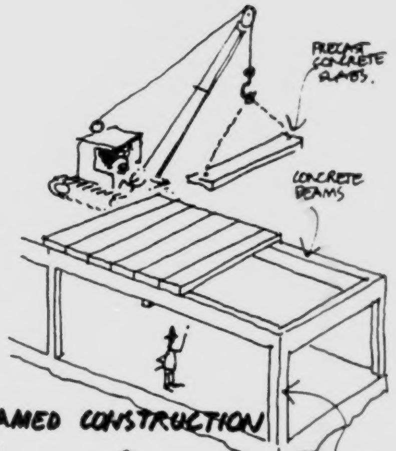
The kind of construction employed is affected by building regulations, environmental conditions, degree of flexibility required along with cost and time factors. This section covers:

- the various types of construction appropriate for use in schools (5.1.1)
- regulations governing school buildings (5.1.2)
- types of construction suited to climate and environment, external and internal (5.1.3)
- building schools that are adaptable and able to be changed (5.1.4)

5.1.1. Types of Construction

This section is intended for members of the planning team who lack knowledge of the various kinds of construction. There are essentially three kinds of construction used in schools:

- framed
- load bearing walls
- prefabricated



FRAMED CONSTRUCTION

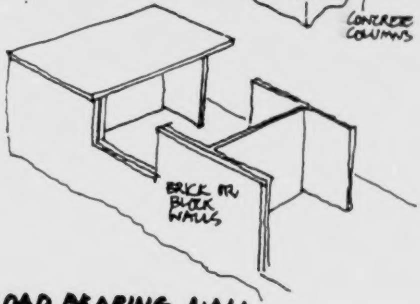
Framed Construction

Where floors and roofs as well as walls are supported on a frame of some kind for example steel or concrete columns and beams this is referred to as framed construction.

The structural floors are usually reinforced-concrete slabs or steel floor panels or pans supported by beams with concrete laid in them.

The frame is most likely to be made of steel or reinforced concrete. The materials used will depend on building code requirements applying to the particular situation.

This kind of construction usually provides maximum flexibility provided the spacing of the supporting columns allows the kind of spaces for classrooms.



LOAD BEARING WALL CONSTRUCTION

Load Bearing Wall Construction

This is where the walls are designed to carry the load of structures such as an additional floor or roof. Walls carrying the load of floors above are usually brick or concrete block. In the kind of construction to be used in schools the building codes do not permit timber-framed walls to carry loads other than roofs.

When considering altering existing buildings, the function of walls needs to be carefully evaluated before any wall is removed. Walls carrying loads can be sometimes be moved if an alternate structure is provided, such as a beam, or if the load is transferred to another part of the building in some other way.

Prefabricated Construction

The classrooms are fully or partly constructed away from the school site and brought to the school in a state almost ready for use. The principle advantage is that it avoids weather delays. Access for the heavy vehicles involved in transporting them to site as well as the lifting equipment is sometimes a constraint.

When preparing budgets ensure that all infrastructure costs are taken into account, such as paths, services, transport, foundations and the like.

5.1.2. Building Regulations

NO BUILDING work should commence without formal approval. Some cases in which approval has been assumed and work commenced have resulted in councils requiring demolition of any work done prior to the issue of formal approval documents.

Building Code of Australia (BCA)

The most significant and least flexible building regulations of those governing schools are those regulations incorporated in the relatively new BCA. The BCA applies throughout Australia, although some aspects of the code reflect particular state requirements. The BCA covers matters such as:

- fire resisting construction
- means of egress, widths, maximum distance of travel
- dimensions of stairs
- emergency lighting
- light and ventilation requirements
- room size, ceiling heights
- toilet and washroom facilities
- food services areas

The BCA is administered by local shire and municipal councils through the following processes:

Development Approval (DA)

DA is primarily concerned with planning approval. The main issues considered include:

- zoning
- transport, vehicular movements, buses
- impact on neighbours, noise, shadows, aesthetic
- outside appearance of the buildings
- landscaping

To apply for DA, a school should submit to council its complete Master Plan including long-term requirements (and not just the immediate first stage). The DA, in principle, is for the school's total development. DA can take many months if sensitive issues are involved. DA's can be varied by application to Council.

Building Approval (BA)

BA is required from local council for the construction of a particular building. BA is primarily concerned with construction methods, fire risk, health and safety issues, distances from boundaries and room sizes. Obtaining a BA can take months. Support documents must be submitted including:

- drawings and specifications

- structural engineering drawings and design calculations
- mechanical services (air-conditioning and ventilation equipment)
- drainage and water supply systems
- emergency lighting systems
- fire fighting systems

Other organisations that regulate school buildings

- fire brigade
- water supply authorities
- gas supply authorities
- electricity supply authorities
- education authorities
- state government

Each state will have variants of the Building Code of Australia, though these are being progressively reduced. Similarly local authorities will impact on school buildings in different ways. For example in South Australia there have been "trade-offs" as regards fire fighting equipment. The usual fire services are rationalised in exchange for counter-balancing safety measures, the rationale being that teachers not used to fire-fighting equipment are better utilised in the safety and well-being of the children.

The school's planning committee needs to make a careful assessment of the approval procedures required at an early stage of the project and make adequate time allowance for all approvals.

5.1.3. Environmental Considerations

The environment has an impact on the way a school is to be designed and built. Aspects of the environment affecting design and construction methods include:

- general weather factors
- city, suburban or rural factors
- socio-economic nature of locality

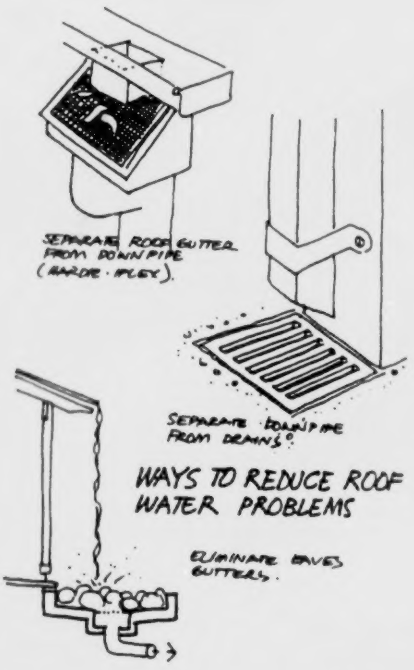
Weather factors

School buildings need to provide shelter from rain, wind, extremes in temperature and, in some locations, snow and sleet.

Construction for rain

Heavy rain requires:

- large roof gutters and downpipes (consider ways to alleviate blockage by leaves and other debris)
- an alternative to roof gutters is no gutters with appropriate protection of the ground below to prevent scouring of the ground and above door openings to shelter people
- significant slope in paving


SEPARATE ROOF GUTTER FROM DOWNPIPE (MARDIE · IFLEX).
SEPARATE DOWNPIPE FROM DRAINS.
WAYS TO REDUCE ROOF WATER PROBLEMS
ELIMINATE EAVES GUTTERS.

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- large drain pits and ground drainage pipes
- sheltered areas adjacent to play areas

Persistent light rain requires:

- covered walkways between buildings or buildings that are totally enclosed
- areas for storage of wet weather clothing and umbrellas, preferably drained

Construction for wind

In areas where there are strong winds schools need to consider:

- doors and windows that are well sealed when closed to prevent disruption by noise of wind
- sufficiently strong door closers
- roofs and walls that can withstand fierce winds
- outdoor shelter for students. A solid wall may be less effective than a perforated wall
- heavier ceiling tiles or tiles with clips where suspended ceilings are specified; or alternatives to suspended ceilings. Tiles in suspended ceiling grids can sometimes lift in high wind.

Construction for snow

Snow and sleet are problems in very few Australian schools. In these areas, schools should require that:

- access ways are free from snow falling off roofs
- paths are constructed so that they do not ice up
- snow is cleared from exits and entrances
- roofs are strong enough to withstand expected snow loads

Kinds of construction for extremes of temperature

The most significant weather factor to be considered is temperature extremes. Depending on the type of climate, lightweight or heavy construction can be chosen after weighing the advantages against the disadvantages.

- Lightweight construction is framing covered with thin materials such as fibre-cement sheeting or formed-steel panels
- Heavy construction means brick, stone or concrete walls.

Lightweight construction can be used in environments where conditions are mild or where insulation can overcome the extremes of temperature.

advantages

- does not retain heat - ideal where breezes can alleviate hot weather
- generally cheaper than heavy construction
- relatively easy to change if rearrangement of space is required

disadvantages

- difficult to insulate for extremes of temperature
- difficult to isolate acoustically - noise travels between rooms both through walls and through floor construction
- more easily damaged than heavy construction

Heavy Construction can be used where temperatures are high and buildings are likely to be unoccupied at night. For the reason that during the day, the heavy masonry (brick, stone, concrete) absorbs the heat (functions as a "heat sink") and re-radiates during the night. Under these conditions, the heat must be able to radiate to the outside, that is, the space must be well-ventilated.

Heavy construction might also be used in very cold environments provided appropriate insulation is used to retain heat inside.

advantages

- good resistance to damage
- in cold environments, retains heat and re-radiates it (stabilises environment)
- in hot environments, functions as heat sink (suitable if ventilation allows dissipation at night, when building is unoccupied)

disadvantages

- difficult to repair damage when it does occur
- not suitable where ventilation does not provide for dissipation of heat after hours
- difficult to modify if change is required

Impact of city locations on construction

A school to be built in the city will generally be required to conform to higher standards of construction in terms of durability and weather resistance. Maintenance standards will be higher. Resistance to vandalism may have to be higher than in the suburbs.

Conformity to design standards, to planning schemes and provision for servicing are also likely to require greater expenditure than in the suburbs or in a rural environment.

Socio-economic nature of locality

If a school is to have relevance to the community it serves, it needs to adopt similar standards of design, planning and material selection to that generally applicable in the community.

A school drawing from a rural community used to an agricultural lifestyle should reflect this aspect in the choice of materials most common in that area. A school in a highly industrialised or business-oriented area would reflect planning approaches and design standards compatible with that community.

5.1.4. Constructing for flexibility

Flexibility in design should be one of the primary aims in designing school buildings in view of the current educational climate. Changes to curriculum, methods of teaching, class structure arrangements, retention rates and technology have placed an increasing demand on planners to design "flexible" schools, i.e. schools that can be changed/adapted as demands change.

The choice of construction method will have a significant impact on the degree to which a building can be adapted and modified. In design terms the greatest constraints on flexibility are:

- foundations
- services
- external walls
- roofs
- other buildings.

Therefore these aspects of design must be carefully considered initially.

Generally only the internal walls can be modified. Internal walls constructed from brick or concrete masonry are difficult, messy and costly to remove and replace. Where they are also used as structural supports for roofing or floors the limitations are even greater. On the other hand, framed and sheeted walls (e.g. plasterboard on lightweight steel framing) is relatively inexpensive to move. These walls are not used for load bearing purposes but, in certain cases, may be used to support ceiling framing.

Other design alternatives which provide flexibility:

- timber framed walls sheeted with chipboard or plywood sheeting
- transportable walls - supported on tracks hung from the ceiling or roof framing
- demountable walls or partitioning

Cost considerations for internal walls

Construction methods ranked in order of cost (the cheapest listed first):

- metal-framed walls sheeted with plasterboard
- timber-framed walls sheeted with chipboard
- demountable walls or partitioning
- masonry walls
- transportable walls

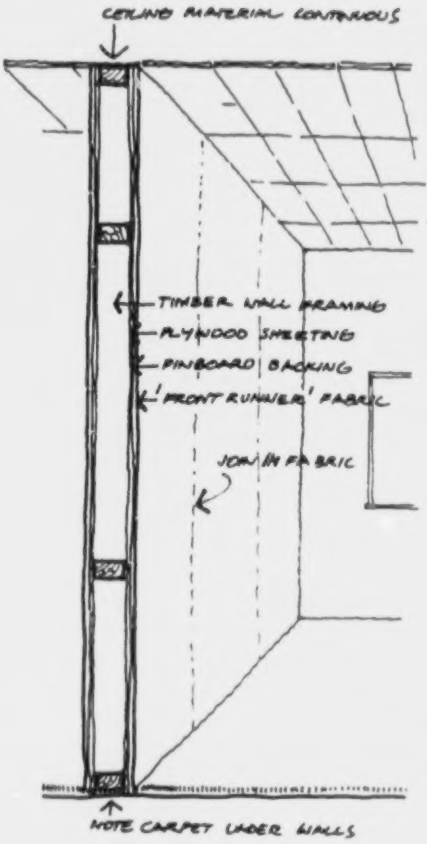
Construction methods ranked in order of ease of change (easiest and cleanest listed first)

- transportable walls

- demountable walls or partitioning
- timber-framed walls sheeted with chipboard
- metal-framed walls sheeted with plasterboard
- masonry walls

Construction methods ranked in order of potential for reuse of materials (though not necessarily the cheapest when labour is considered in the cost analysis) - most convenient and highest reuse first:

- transportable walls
- demountable walls or partitioning
- timber-framed walls sheeted with chipboard
- metal-framed walls sheeted with plasterboard
- masonry walls



Some examples:

Timber-framed walls: Plenty Valley Christian School - located north of Melbourne, rural Victoria

All internal walls are constructed of timber framing, sheeted with chipboard and pinboard base covered with "Front runner" a melded fabric ideal for wall covering. Architect was Paul Archibald.[1]

advantages

- most of the material can be reused
- there is no painting of internal walls, reducing maintenance significantly
- changes can be made in a very short space of time
- deterioration rate of wall finishes is very low - does not show scuffing marks

disadvantages

- initial cost was higher (but in long term is regarded as being cheaper)
- reverberation time in room is very low (not a significant issue and can be an advantage)

Metal-framed walls: Pacific Hills Christian School - Dural, outer suburb of Sydney NSW

Most of the internal walls are metal-framed sheeted with plasterboard, set and painted. The walls are non-loadbearing, the roof is supported on steel columns and beams, the columns being sufficiently spaced to give adequate flexibility in locating walls. Several changes have been made demonstrating the benefits.

advantages

- ease of making changes

---

[1] *Paul Archibald Pty Ltd Architects 2a Milne Rd, Box Hill North, Vic Phone (03) 899 1088*

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- easy to maintain
- relatively low initial cost

disadvantages

- easily damaged - can be overcome with tougher finishes such as timber boarding or carpet at low levels
- sound travels through walls - needed acoustic insulation (note - fibreglass not suitable, use material specifically appropriate for sound isolation)

Transportable walls

These are panels, usually around 90cm wide and extending full-height to the ceiling. The panels are usually well designed acoustically with adequate density and acoustic seals at floor and ceiling and between each panel.

The panels are supported on tracks hung from firmly supported and substantial steel framework. For adequate acoustic isolation between rooms it is important to install an acoustic baffle between the ceiling and the roof or floor above.

If the intention is to make one larger space from two or three classrooms by opening up doors, ensure that the door panels are full height to the ceiling. If door panels are normal door height the room acoustics will be poor - it will not be easy to project the voice from one end to the other without significant amplification. The fixed panel above the doors will act as a barrier.

advantages

- maximum flexibility
- good acoustic isolation if properly constructed

disadvantages

- expensive
- the acoustic benefits deteriorate due to changes in surrounding structure, e.g. the floor slab sags, the seals become damaged. This can be overcome at the top of doors by providing for some adjustment.
- heavy for students to move and, if not carefully handled, can be damaged

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5.2. Materials and Hardware

This section covers materials selection as to appropriateness, durability, repairability, maintainability, reusability and cost effectiveness. Given the wear and tear schools receive from a continuous influx of students, materials and hardware choices require careful consideration. In addition there are factors pertaining to functional use and performance. For example, a room used for music rehearsals requires a high level of sound absorption, while a performance area requires a degree of reverberation or resonance. The surfaces to achieve these conditions will be quite different.

The following factors influencing choice of materials and hardware for use in a school building are examined in this section:

- durability (5.2.1)
- weather resistance (5.2.2)
- resistance to vandalism (5.2.3)
- aesthetics (5.2.4)
- cost (5.2.5)
- cleaning costs (5.2.6)
- re-use potential (5.2.7)
- fire-risk (5.2.8)
- acoustic performance (5.2.9)
- acoustic and heat insulation (5.2.10)
- resistance to chemicals (5.2.11)
- repairability (5.2.12)
- light reflectance and glare factors (5.2.13)
- adaptability (5.2.14)
- materials appropriate to the environment (5.2.15)

In most cases, more than one characteristic must be considered, often involving compromise. For example, if durability is considered a high priority, a very durable floor surface may be considered, such as polished or steel-trowelled concrete. This type of surface, however, has a number of negative characteristics such as: slippery when wet, highly reflective acoustically and unattractive colour. If the negative factors can be overcome, the overall benefits of the cheaper solution may make this selection an acceptable floor finish. Otherwise a surface less durable may have to be selected to achieve other characteristics.

An excellent guide to materials suitable for use in schools was produced by the Commonwealth Schools Commission in 1982 called "Comparative suitability of materials for use in Australian schools". This publication is no longer in print, but copies may sometimes be found on the shelves of established schools or at the local Block Grants Authority Office.

5.2.1. Durability

Durability is the capacity of a material to resist wear and tear. Durability needs some consideration as regards the approach the designers are to take. For example: is the approach to be low initial cost and high replacement cost or high initial cost and low replacement costs? Is the area vulnerable to vandalism? Is the school likely to cater for students who care? Will high quality finishes enhance or encourage a caring response or will they be ignored?

Areas requiring high durability include:

- paving and walls in high pedestrian traffic areas
- areas exposed to impact from balls, school bags, equipment trolleys and cleaning equipment

Durable materials include:

- Concrete. Concrete when used as paving needs to have a coarse, ribbed or textured finish. This can be achieved for example by spraying with water prior to it setting to expose the aggregate or dragging a course broom across it prior to setting. Concrete and brick, when used as wall finishes, must be sealed in some way. These kinds of finishes are difficult to repair in a seamless fashion - the patch is difficult to conceal.
- Brick. Only sufficiently hard bricks (hard usually as a result of longer firing in the kiln) should be used for paths and paving.
- Ceramic or terra cotta tiles. Only ceramic tiles with a non-slip finish should be selected for floors. Ceramic is probably the best wall material but is very expensive and usually used in wet areas only, such as washrooms, toilets and cooking areas.
- Compressed fibre cement used as a wall surface, roof fascia material with a colour coating or as a floor with a floor finish such as ceramic or vinyl tiles.
- Hardwood is well-known as a flooring material which, with appropriate finishing, is suitable for school use.

These materials can be used as both floor and wall finishes although not all of them are equally suitable as a floor finish.

Other aspects of durability pertain to impact and vibration from slamming doors and windows, wear and excessive force on door handles and hinges, student "testing the strength" of materials and fittings, and the ability of fixings such as screws and bolts to resist unauthorised removal or vandalism.

5.2.2. Weather resistance

Weather affects buildings in the following ways:

- rain penetration
- grime becoming embedded with the rain as in stone or concrete and brick masonry
- frost damage in colder climates,
- expansion and contraction in hot climates

A moisture-resistant external surface may be achieved in ways such as:

- masonry wall with two skins - this is called cavity construction
- materials impervious to water
- roof overhangs; protecting the surface from rain impact

5.2.3. Resistance to Vandalism

Materials that minimise vandalism are increasing in importance. A significant portion of the maintenance budget may have to be allocated to this purpose. Some constructive solutions to this problem are as follows:

- strategically placed fences, general building layout and plant screening of walls to make external surfaces less exposed or inaccessible
- use of materials that are not easily damaged or that do not provide an appropriate surface. A highly texture surface deters graffiti as the writing is difficult to read – effective because recognition seems to be important to vandals in their choice of surfaces to deface
- treating surfaces – there are a variety of proprietary applied finishes, some transparent, that are vandal-resistant.[1]

5.2.4. Aesthetics

Aesthetics pertain to juxtaposition of materials to achieve a balance and harmony of colour and textures. Materials chosen for their natural colour (e.g. bricks) are usually preferable to applied finishes such as paint. This principle applies unless the material, such as plasterboard, requires a paint finish.

Avoid choosing an applied finish that is less durable that the surface to which it is being applied. Painted face brickwork fails this principle. There may be a case for painting concrete, although it is highly durable, due to the difficulty in achieving consistent colour throughout as variation in drying time affects colour.

Another important factor is the durability of a material – the longer it resists damage and grime, the longer it will retain its inherent aesthetic appeal.

5.2.5. Cost considerations

The initial cost of the material should be compared with its maintenance cost to the end of its useful life. If an alternative material produces a lower life cycle cost outcome, then it should be used, unless initial costs must be kept low for a particular reason. If in doubt, initiate a life-cycle analysis of the material.

Quite often short-term savings on cheaper materials are offset by increased repair and maintenance bills in the long term. A classic example is the use of glass doors in secondary school corridors. If the glass is broken frequently, and eventually has to be replaced by poly-carbonate sheet (much more expensive than glass but far more durable) then the initial expense can be justified not only in reducing the cost of the repairs, but also, the time and effort of school staff in arranging the repairs and disciplining the students.

The following factors influence the cost of materials:

- transport costs (transporting materials from areas far from their source or place of manufacture will increase costs)
- large areas of application (i.e. high-volume purchase of the material) will usually result in lower unit cost, conversely small areas (i.e. low-volume purchases) will result in higher unit cost
- demand-driven prices – in periods of low building activity, prices decrease, conversely high activity (resulting from high demand) drives up prices

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[1] *Refer Appendix 9.11 for A list of Anti-graffitti products*

5.2.6. Cleaning Costs

The planning team should formulate a general policy with respect to cleaning: whether building materials should be chosen to keep initial costs low (usually resulting in high cleaning and maintenance costs) or whether initial costs may be high (to minimise cleaning and maintenance costs).

A life-cycle cost study should be made of all significant materials, particularly floors. This study should also include an analysis of all maintenance and replacement costs. For example a vinyl sheet floor may be cheaper both in terms of initial cost and wear replacement costs (vinyl floors have a long life). However, the cost of cleaning vinyl, including regular stripping, repolishing and buffing can far outweigh the cost of cleaning carpet. Life-cycle costings may well indicate that carpet is less expensive than vinyl sheeting.

LIFE CYCLE COSTING
BASED ON 100 sq m

	MATERIAL	
	CARPET	VINYL TILES
INITIAL COST	3579	2200
USEFUL LIFE	10 YRS	15 YRS
PER ANNUM COSTS		
CAPITAL	358	147
CLEANING VACUUM 1 X DAY	900	
SWEEP/MOP 1 X DAY + BUFF 1 X WEEK		1800
STRIP/POLISH 3 X YR		600
	$1258	$2547

5.2.7. Reuse Potential

Reuse potential is of minor importance to school planners, however it is worthy of discussion since it may have a bearing on material choice and on longer term planning. Reuse potential is relevant to schools in the initial stages of development where buildings have to be modified as the school grows.

Plywood, particle board and panels of polyurethane foam with sheet metal or fibreboard are reusable materials, but reuse potential depends as much on fixings and joining methods as on the material itself. Modular window walls of aluminium framing, folding walls, doors and windows are other building materials which may be reused.

Just because a material can be reused does not mean it is the most economical. Reuse may involve greater cost than using new materials.

Keys to maximising reuse potential are:

- modular planning (based on a grid so that elements fit wherever they may be placed)
- consistency throughout the building in room sizes, finishes and construction
- planned approach to the level of reuse of materials intended so that designers can act accordingly
- care with the way materials are joined and fixed so that demounting these materials and building elements can be achieved with minimum damage.

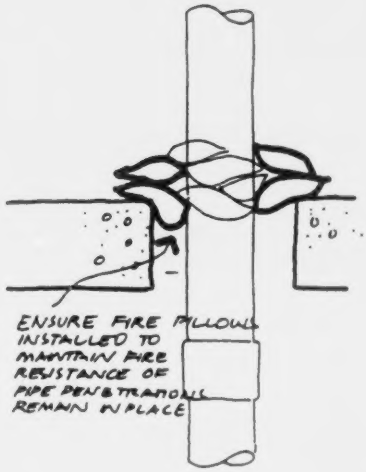
5.2.8. Fire-Risk

Fire hazard is among the greatest threats to safety in school buildings. Hence, the importance of fire safety in the building codes and to the relevant authorities. The Building Code of Australia

(BCA) refers to two aspects of materials in relation to fire. These are:

- flammability index
- spread of flame index

They are also described in detail in Australian Standards AS 1530. They pertain to the degree to which materials ignite or spread flame. A material may ignite, but burn slowly and not spread flame (e.g. wool carpet). The materials used should burn with a minimum of toxic gases and smoke. Confined areas such as stairs and fire escape passages must remain free of hazardous gases for specified times. It is best to leave consideration of these aspects to professional building consultants or builders with experience in these matters.



ENSURE FIRE PILLOWS INSTALLED TO MAINTAIN FIRE RESISTANCE OF PIPE PENETRATIONS REMAIN IN PLACE

The fire zone in which the school is located will determine the degree to which these standards and requirements apply. For example, a school in a high-risk fire zone will require higher levels of fire resistance than a school in a lower-risk fire zone.

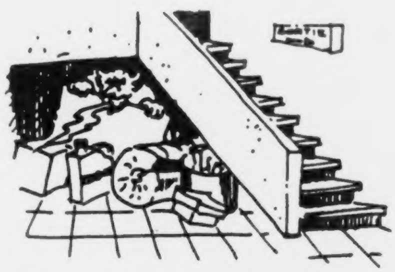
Walls near a boundary or isolating a fire escape are required to have a higher fire resistance than other areas of a building. A specially formulated mulched paper with additives to reduce flammability to safe levels can be sprayed on to ceilings and high walls.

There are other requirements pertaining to the capacity of various parts of a building to resist fire. The capacity of a construction to resist fire is expressed in three ways:

- structural adequacy
- integrity
- insulation potential

In the BCA, structural adequacy specifications are given in the following form, 90/60/60, which means that the material:

- is capable of resisting fire and remaining structurally adequate, i.e., it will continue to do what it was designed to do for 1.5 hours (structural adequacy)
- will not fracture and let flame through for 1 hour (integrity)
- will satisfactorily isolate the area on the other side of the material from unacceptable heat for 1 hour (insulation potential).



BUILDING CODES FORBID STORAGE OF ANY KIND IN FIRE ESCAPES & STAIRS

The purpose of these requirements is to permit safe egress from the building and sufficient time to access the building to extinguish the fire.

Planning teams must understand these concepts well enough to adequately brief the users of the building in safe management practices, which include:

- banning storage or use of flammable materials in main thoroughfares, especially in designated escape passages and stairwells

- maintaining required signs related to storage and safe passages (noticeboards should not be made of flammable material)
- not using materials likely to emit noxious fumes or smoke which inhibit clear passage for escape

Doors as Exits

The Building Code of Australia requires that every door functioning as a required exit be readily opened from inside by a single-handed action without a key. This means that locks cannot be used to secure the door from the inside. To lock the door against egress contravenes regulations and safety. Schools may find security compromised as people left inside the building can open the door at any time after the building is "locked up", leaving the building open to unauthorised entry.

Solutions include:

- use of door closers on such doors
- alarm systems to warn of doors being used after hours
- training programs for staff on security and safety requirements for exit routes
- signs on exits discouraging use after hours and/or
- signs encouraging users to shut doors

State laws vary on these matters, therefore the building design consultants should provide clear direction as to appropriate regulations.

Required fire isolation enclosures

Mandatory enclosure of certain spaces to provide safe egress require complete integrity, that is no breaks that will reduce the fire resistance of the enclosing elements (walls, ceilings and floors).

Such spaces should not be altered by construction/services etc. Integrity could be jeopardised if the service itself is flammable (e.g. a gas pipe) or if the holes through which the service passes are left untreated. When penetrations are required, they can be sealed with "fire pillows" or fire-resistant mastic.

Management procedures should be established that require consultation with relevant experts before modifications can be approved.

5.2.9. Acoustic Performance

A good aural environment will allow the wanted sounds to dominate the background sounds and will filter out or block unwanted ones. Clear communications rely significantly on dealing effectively with the various aspects of acoustics.

Noise Levels

● Road traffic noise

For locations adjacent to roads carrying traffic, typical peak (L_{10})[1] and background (L_{90})[2] levels are given in table 1. The levels are based on kerbside measurements — 8.0 m from road centre line.

Road type	Two way traffic (vehicles/hour)	Peak (L_{10})	Background (L_{90})
Arterial road with heavy traffic	2000	dBA 75	dBA 60
Major roads with medium traffic	1000	70	55
Residential roads with medium traffic	400	65	50
Minor roads with local traffic	100	60	40

TABLE 1: TYPICAL NOISE LEVELS FOR ROADS CARRYING TWO WAY TRAFFIC[3]

● Aircraft noise

The intermittent nature of aircraft noise makes it difficult to assess which levels cause annoyance in the community. Factors such as type of plane, climb or descent characteristics, power thrust and height above ground level govern both the noise level and its associated degree of annoyance.

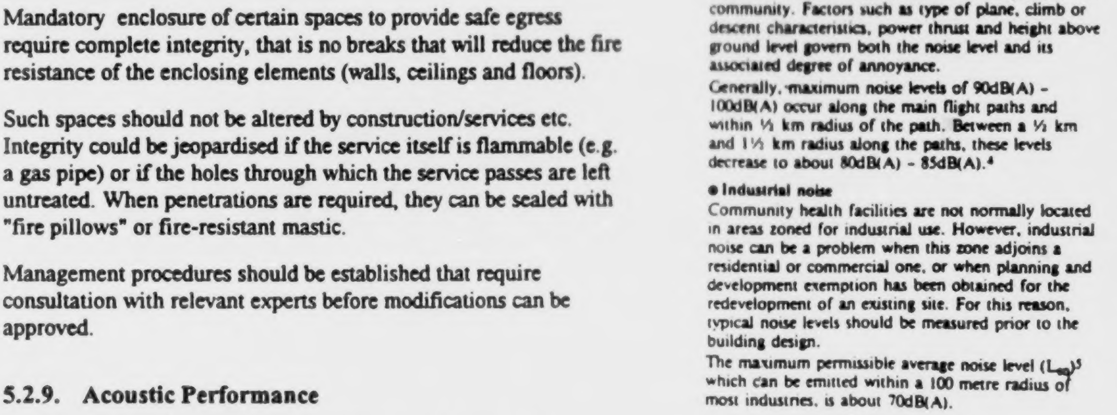
Generally, maximum noise levels of 90dB(A) - 100dB(A) occur along the main flight paths and within ½ km radius of the path. Between a ½ km and 1½ km radius along the paths, these levels decrease to about 80dB(A) - 85dB(A).[4]

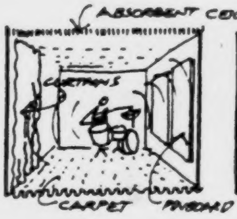
● Industrial noise

Community health facilities are not normally located in areas zoned for industrial use. However, industrial noise can be a problem when this zone adjoins a residential or commercial one, or when planning and development exemption has been obtained for the redevelopment of an existing site. For this reason, typical noise levels should be measured prior to the building design.

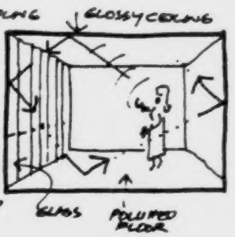
The maximum permissible average noise level (L_{eq})[5] which can be emitted within a 100 metre radius of most industries, is about 70dB(A).

Information from "Design of Doctor's Surgeries" published by Royal Australian College of General Practitioners




ABSORBENT CEILING
CURTAINS
CARPET
PINBOARD

DEAD SPACE

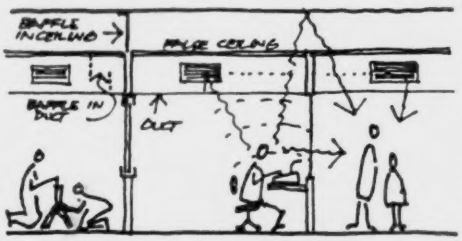

GLOSSY CEILING
GLASS
POLISHED FLOOR

LIVE SPACE
REVERBERANT SPACE

The main requirement for much of a school's acoustics is for the speech spectrum, and this is the easiest to provide. Different spaces produce different levels of reverberation. This quality has to do with the way a room responds to noise. If the sound continues for a long period it is said to have a long reverberation time. Reverberation is different from echo.

Echo

Echo is the result of clear sound "bouncing" off a surface in a way that the original sound is reproduced. Echo is to be avoided as it interferes with clarity of communication. Echo produces a "hard edge" to sound and is much less diffuse than reverberation.


BAFFLE IN CEILING
FALSE CEILING
BAFFLE IN DUCT
DUCT

TAKE CARE TO CONTROL SOUND BETWEEN SPACES/ROOMS

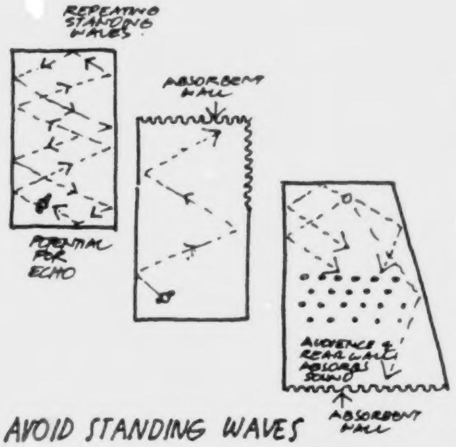
Reverberation

Reverberation, to some degree, is desirable. It is much more diffuse than echo and contributes to the production of sounds that are referred to as rich or mellow. The chosen degree of reverberation will depend on the proposed use of the room.

Spaces for musical performance should have long reverberation times. Spaces for drama and speech (classrooms) should have reasonably short reverberation times. But not so short that the space sounds harsh or dead.

Several factors influence echos and reverberation time:

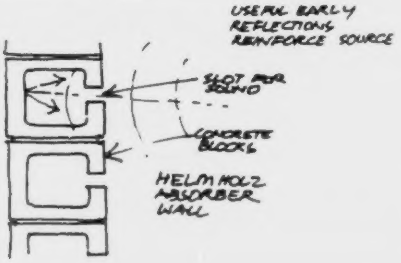
- shape of room
- materials used on the surfaces
- degree of occupancy


REPEATING STANDING WAVES
POTENTIAL FOR ECHO
ABSORBENT WALL
AUDIENCE & REAR WALL ABSORBS SOUND
ABSORBENT WALL

AVOID STANDING WAVES

Shape

Most large rectangular spaces produce undesirable echos unless walls are specially treated. The reason is that standing sound waves will be created in the room (caused by sound reflected between parallel walls). One possible solution is to change the shape of the room so that walls are not parallel.


USEFUL EARLY REFLECTIONS REINFORCE SOURCE
SLOT FOR SOUND
CONCRETE BLOCKS

HELMHOLZ ABSORBER WALL

Materials

Materials that can reduce echo and reverberation include:

- increasing window area (effective only when windows open). A window is the perfect absorber - it is used as the measure of sound absorption in acoustic calculations.
- installing soft material on the floor and on at least one wall. Materials on the walls such as carpet, large areas of curtains, soft fibreboard and acoustic tiles all assist in absorbing sound.
- soft furniture. Soft furniture may help to reduce echo.
- Helmholz absorbers - hollow blocks with slots to "swallow" the sound are sometimes used in spaces such as gymnasiums to reduce sound levels.

The degree to which materials reduce reverberation or echo can be assessed by trained acoustic engineers.

Science rooms are notoriously difficult to manage acoustically due to the preponderance of hard surfaces. Solutions such as squares of carpet in the centre of science laboratories to reduce reverberation and to reduce sound at the source (chair legs scraping on the floor) have been used successfully in a number of schools.

Another solution is to hang acoustic baffles from the ceiling around the room.

In rooms where sophisticated acoustics are required (e.g. music performance) compensating materials can be installed (e.g. curtains drawn across walls) to allow adjustment of the reverberation time.

Degree of Occupancy

A room which is full of people will have a shorter reverberation time (less echo) than a room which is empty.

5.2.10. Insulating for Heat and Acoustics

There is a great deal of misunderstanding over the insulating value of materials for acoustics and for heat. In this section, sound insulation and heat insulation will be defined and explained.

Sound insulation

In the section on acoustics above (5.2.9) insulating against reverberation or echo *within* a space was covered. Here, the focus is on insulating against sound travelling from one space to another through walls or doors (usually unacceptable except at low levels).

Contrary to what may be required to reduce sound within a space, namely soft or low density materials, dense materials are the most effective for *isolating* sound to a particular space.

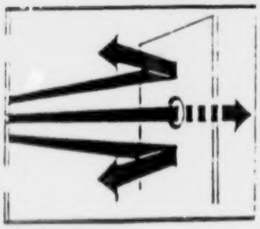
When soft material such as glass fibre batts or dacron blankets are used, their effectiveness relies on cutting down reverberation within the wall cavity. Some of these materials, specifically designed for acoustic isolation, are effective. Choose such materials with care and check carefully with the manufacturer before specifying. Double thickness plasterboard or a similar material may be just as effective.

Heat Insulation

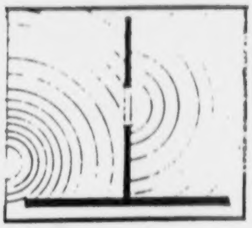
The most effective insulation for retaining heat in a building is material containing static air masses or reducing air-movement within the surrounding walls. Fibreglass and Dacron blankets or batts are usually used for this purpose.

In roofs, locate insulation against the roof surface to reduce drumming of heavy rain as well as to isolate heat at the outer surface of the building. To prevent condensation from forming within the insulation, thus destroying the insulation value, place a moisture barrier of polyethylene film under the insulation, making sure that the seal remains effective at the joining of the materials. Maintenance staff should understand the function of this barrier to ensure that when it is breached (to install other services or for maintenance) the barrier must be restored.

To limit heat coming in to a building some have relied on reflective "sarking" - a building paper with a reflective surface to reflect heat back to the roof surface. This is effective only while the reflective capacity persists - dust and grime quickly destroys its functionality.

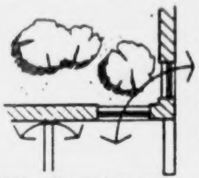


HIGH FREQUENCY
SOUND PASSES
THROUGH
AIR GAPS



LOW FREQUENCY
SOUND
RERADIATES FROM
AIR GAPS

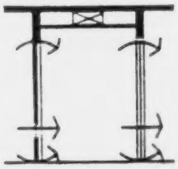
adjacent windows



Avoid adjacent windows where possible or use fixed glazing.

Seal wall junctions and wall penetrations gaps with non hardening mastic

adjacent doors

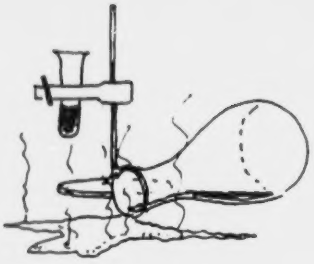


Fit solid core doors with acoustic seals. Relocate silenced air vents in wall or ceiling.

Illustrations from "Design of Doctor's Surgeries" published by Royal Australian College of General Practitioners

This kind of insulation does nothing to contain heat within a building.

5.2.11. Resistance to Chemicals



The chemicals used in science rooms, art rooms, materials laboratories and food technology rooms are rarely sufficiently volatile to warrant excessive expenditure on bench and shelf surfaces.

Science areas are more vulnerable to damage from chemicals than are food preparations areas. In both areas, staining is the more likely problem and for this reason alone, chemically resistant surfaces are usually preferred.

There are three ways to provide the required protection, the first two being suitable in food preparation areas only:

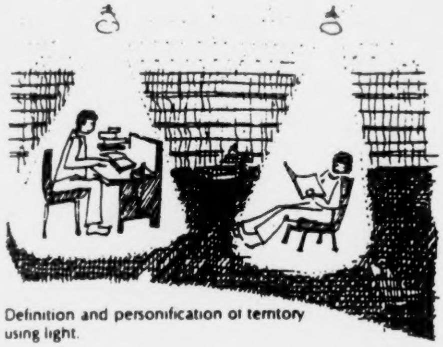
- chemical-resistant grade melamine laminate
- full thickness bench top material, AZTEQUE, made by Laminex
- chemical-resistant applied finishes (paints)

The benefits of the latter two are that they are repairable (no surface is completely resistant to accidental or deliberate damage).

5.2.12. Repairability

In selecting materials for use planners should keep in mind:

- the time required for repairs
- the degree to which matching materials is possible
- safety in repair process (no toxic fumes for example)
- the degree to which expertise is required and available (is it better to use a material which can be repaired by a handyman)



Definition and personification of territory using light.

5.2.13. Light Reflectance and Glare factors

A major activity in schools is reading and work relying on high visual clarity. For this reason designers must give careful attention to lighting both artificial and natural.

Glare results when there is too much contrast between the object of primary interest and the surrounding surfaces. In these circumstances the eyes are required to adapt to the varying intensities too much and tiredness results. This is especially true when the surrounding surfaces are much brighter than the primary object. It is recommended that the following rules be implemented to minimise glare:

- no large area should have a brightness less than one third the task brightness
- no area adjacent to the task should be brighter than three times the brightness of the task
- no area in the visual environment should be brighter than five times the brightness of the task.

RECOMMENDED ILLUMINANCES

Classroom	500 LUX
Drafting & Graphics	500 LUX
Laboratories	500 LUX
Library Reading	500 LUX
Offices	500 LUX
Shop Area	500 LUX
Typing Rooms	500 LUX
Auditoriums	250 LUX
Cafeteria	250 LUX
Gymnasium	250 LUX
Library Stacks	250 LUX
Washrooms	250 LUX
Corridors	250 LUX
Mechanical Rooms	250 LUX
Storage Areas	100 LUX

* Based on the report "Lighting for Education," Ontario Ministry of Education, 1981

Avoid placement of chalkboards and desks in direct sunlight.

The direction of lighting, be it natural or artificial has a large bearing on how objects are perceived.

Remember also that the needs of children may differ from those of adults - for example the working plane for children in younger classes may well be the floor, therefore ensure adequate lighting is provided at this level.

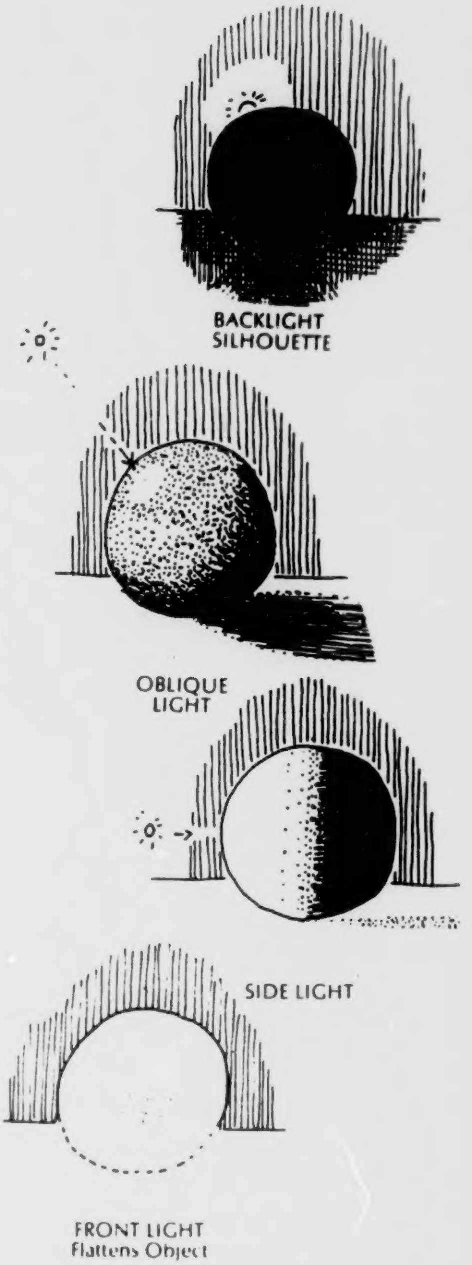
5.2.14. Adaptability

Where the school is in a growth phase and rooms need to be changed or adapted to suit various functions, appropriate materials should be chosen. For example, walls covered with pinboard material (floor to ceiling) adapt to a wide variety of functions.

5.2.15. Materials appropriate to environment

Material selection varies with the intensity of use of a facility. For example, areas of high student use (especially wet areas) require materials that are hard-wearing, whereas areas, such as reception and staff areas, may be designed using more aesthetically pleasing materials.

When preparing briefs for design consultants, include a policy regarding finishes and the likelihood of vandalism. This policy will assist the design consultants in choosing from the wide range of available finishes. For example, tiles need not be the only vandal-resistant finish available for wet areas. High-quality epoxy finishes are often more suitable for such areas.



PERCEPTION OF SHAPE
Modelling effect of light
The effects vary with direction, intensity and colour of the light source.

5.3. Building Services and Systems

This section will deal with the service systems essential to schools:

- electrical systems, light and power (5.3.1)
- plumbing systems. water supply and drainage (5.3.2)
- emergency lighting and warning systems (5.3.3)
- lifts and hoists (5.3.4)
- mechanical services, ventilation and air-conditioning, exhaust systems (5.3.5)
- data transfer systems (5.3.6)
- security systems (5.3.7)

How services are to be incorporated into the building, added to as the building requirements change, serviced and repaired and eventually replaced are important parts of the design philosophy developed by the planning team. The following points should be addressed and documented:

- pattern of distribution for services (e.g. are they to be installed in a formal pattern, perhaps as a grid or are they to be installed only as required extending the services when necessary).
- degree of monitoring of services (will school require automatic recording of operation of equipment for evaluation of maintenance effectiveness)
- remote control of services (will school require remote control of sewerage pumping or water supply systems?)
- provision for maintenance of services (e.g. in ducts or exposed)
- provision for expansion of buildings
- provision for enhancing or expanding services

5.3.1. Electrical systems - power and light

In the majority of cases power will be supplied from the national grid via the various supply authorities cable systems. For additional information refer to 2.2.3 and 3.8.3.

Main power supply

In suburban and rural areas power cables are usually aerial. In inner suburbs and the larger cities the supply cables are often laid underground.

When choosing a site for a school, advise the local supply authority, who will then request an estimate of maximum demand power load to ensure that there will be adequate supply. An electrical engineer could supply this information provided adequate information as tompotential enroment is available from the school. The authority may require a pole mounted substation. In this event, a small area of land is usually required to be leased to the supply authority.

From this location a number of conduits for cables would be installed to connect the substation with the main power distribution board for the school. Alternatively aerial cables could bring the power to the building. Provision should be made for several additional cables in underground conduits.

The main power board should be readily accessible by road to enable loading and replacing the large switch gear. Direct access is also required for the meter readers and more importantly for the fire brigade in the event of an emergency.

Internal power distribution

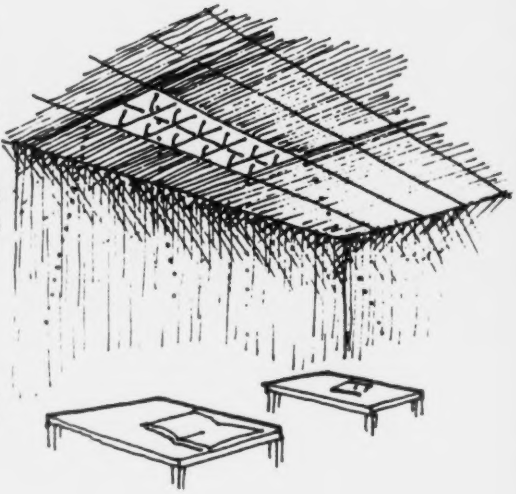
Power is usually distributed via sub-mains cables to sub-boards from which cables run to the outlets in the various rooms. Several outlets are usually connected to a circuit with limitations on the number of outlets per circuit. These limits must not be exceeded as fire risks result from overloading. Each circuit must be protected by a fuse or circuit breaker. For maintenance purposes, outlets should be identified to show the circuit they are connected to.

Adequate provision should be made for additional electrical cables or for easy replacement of existing cables. Where possible, they should be located in ducts or cable trays. Vertical cable trays are better than horizontal trays as they minimise the impact of vermin building nests in the warm environment.

Electrical systems - light

The aim of any lighting system should be to maximise light output for the lowest possible power input. The ideal educational environment would have general lighting on the desk or workbench and on the instructor, with separate spot lighting (can be low wattage equipment conserving power – but expensive to install) on the instructor and instructional aids. But given the variety of uses to which many classrooms are put, this degree of lighting is only feasible in dedicated lecture spaces.

A brightly lit room is not necessarily more effective than one which appears less bright. Low-brightness fittings, often involving a low level of light on the ceiling and more light at the desk level, can be highly effective. Properly adjusted and located, this form of lighting is ideal although more expensive initially. Some savings result from lower cleaning costs, and there are higher levels of light for longer periods.



LOW BRIGHTNESS LIGHT FITTINGS FOCUS LIGHT WHERE IT IS NEEDED

Power savings can be effected by the careful arrangement of switching patterns to minimise usage. For example it may not be necessary to switch on all the lights in a room if sufficient natural lighting is available to one part of the room. Multiple and staggered time switches should be considered.

Lights should operate on a master switch and/or a time clock to ensure than all lights are turned off at the end of a day. These devices allow particular zones to remain lit as required, e.g. for after school activities.

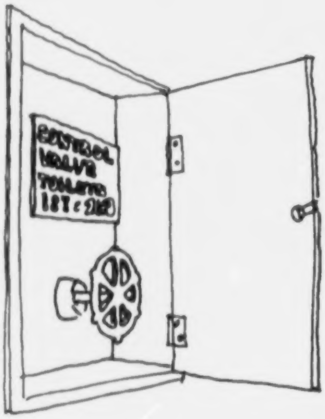
The planning committee should give lighting systems consideration, the decisions to be incorporated in the design brief.

5.3.2. Plumbing and drainage systems

Plumbing and drainage pertain to the water supply and to the disposal of fluids and gases. Both are usually handled by the same group of tradespersons.

Water supply

To ensure adequate water supply throughout the school and to cope with expansion, mains of sufficient size should be installed. An adequate number of control points fitted with valves should be provided. They should be clearly labelled, specifying the areas each part controls. Labelling is crucial for maintenance and for emergency situations.


CONTROL VALVE TOILETS 1ST & 2ND

LOCATE VALVES CONVENIENTLY & CLEARLY IDENTIFY THEM

Main water supply lines should be identified by plaques or signs particularly where there is danger of damage by heavy vehicles or machinery when undertaking further construction.

Water systems for fire-fighting are usually separate from the domestic water supply system. Fire systems should not be modified without consent of the authorities and should not be used for domestic purposes.

Plumbing systems - sanitary drainage

Sanitary drainage is distinct from stormwater drainage. The systems must not be combined. Sanitary drainage must flow to the town sewer or to an on-site sewage treatment system. Any stormwater which accidentally flows into the system disturbs the balance of necessary components of sewage for effective treatment. This applies to both town systems as well as to on-site systems.

All parts of the system must be readily accessible to enable the clearing of blockages. Toilets are best designed with ducts behind the toilet pans to permit access to the back of the fitting (where the majority of blockages occur).

The health and water and sewerage authorities have regulations that regulate the installation of sewerage systems. These deal with size and lengths of pipes, installation of venting systems, traps for foul air etc. For this reason only licensed tradespeople should be permitted to maintain and modify these systems.

Stormwater drainage

Stormwater drainage pertains to the handling and disposal of water from the building and site. Here, the primary focus is on drainage from the building - stormwater drainage from the site itself is dealt with in chapter 2.

The system should be designed to cope with balls and lunch wraps, which tend to clog roof outlets and lead to roof overflows. Include "clear-outs" in the downpipes - the vertical pipes connecting eaves gutters to the stormwater drains on the ground.

One effective solution is to discharge the downpipes over a grate, with a gap between the bottom of the downpipe and the grate. This leads to some splashing but is much easier to maintain than other systems. Another method is to avoid roof gutters altogether. Ground disposal is more expensive to install, but the saving on maintenance may well make the investment worthwhile.

5.3.3. Lifts (personnel and equipment)

Some forms of mechanical lifting may be required for schools catering for students or staff with disabilities. It may take the form of a lift or a platform which is attached to a stair and rises to the next level, using the space above the stair.

As these are rather specialised facilities, further information should be obtained from the manufacturers of such installations.

Electric or hydraulic lift systems may also be required for moving goods to upper storeys of multi-level schools.

5.3.4. Mechanical services

The kinds of mechanical services found in school buildings include:

- air-conditioning
- supply and exhaust ventilation
- dust extraction

Air-conditioning

Air conditioning systems can take a variety of forms including:

- reverse-cycle systems which provide heating and cooling as required
- ducted systems where cooled air is circulated to the spaces by means of ducts
- induction unit system where cooled water is piped through coils over which air is forced into localised areas
- self-contained window or wall units
- split systems where a compressor is located remote from the air distribution system - is effective where noise is a consideration

Generally, cooling is carried out using compressor systems or cooling towers. Cooling towers operate using a spray or shower of recycled water over coolant pipes, and require regular testing and maintenance to ensure that deadly micro-organisms such as legionella bacteria do not build up to dangerous levels in the recycled water.

Evaporative Cooling

Another form of cooling air is evaporative cooling. It is suitable only in relatively dry environments such as the western slopes of NSW and Queensland. The system operates by passing air across a screen over which water is sprayed or dripped. As the warm air moves through the screen it evaporates the water. The latent heat of vaporisation is absorbed and the air is cooled, as a result. As well as being cooler, the air contains more moisture. In a humid environment, such as the east coast of Australia, this system is not suitable as it makes the air uncomfortably humid.

Supply and exhaust ventilation

In schools where rooms are remote from external walls and where it is not possible to provide ventilation via roof lights, forced ventilation, using fans and ducts, is required. The amount of ventilation is usually measured in air changes per hour and are specified in building codes if not in the conditions of building approval.

All ducted systems require maintenance - ducts are notorious for build-up of dust and dust is a fire hazard. Access panels need to be provided and maintenance schedules prepared to ensure that cleaning is carried out.

Dust extraction

Dust from woodworking rooms needs to be controlled as it is unhealthy and can have a high explosive potential.

Dust extractors should be installed in technology rooms where dust producing processes occur. Ensure that switch boards are sealed from dust. Also, ensure that methods of dust disposal do not result in shifting the problem somewhere else.

5.3.5. Data transfer systems

When installing electrical systems, it is important to be aware of the potential electromagnetic interference on computer screens and data transfer systems. This interference is best controlled by providing adequate shielding and/or isolation from other electrical systems and telephone cables.

See Chapter 7 Technology in Educational Buildings for a more comprehensive discussion of the issues involved in installing electrical systems for technology purposes.

5.3.6. Security and emergency lighting and warning systems

Special attention in school design should be paid to regulations to ensure a safe environment. As the amount of expensive furniture and equipment in schools has increased dramatically in recent years, far greater attention must be paid to security and warning systems within schools. Various systems are commonplace in schools, including:

- fire detection and warning
- emergency lighting
- intrusion alerts
- malfunction of critical equipment alerts

Fire detection and warning

Fire detection devices include smoke and/or heat detectors located in critical areas. They should be connected to an alarm panel where staff are likely to be while the building is occupied. After hours they should be capable of being diverted to a caretaker's residence. It is also possible to have an automatic phone dialler system installed. In emergencies, these systems automatically dial a series of numbers until the call is answered.

Regular testing of these systems is important to ensure functionality. Both the detectors as well as the system itself need to be tested. If detectors are fitted with batteries, they should be checked as part of a cycle of regular maintenance.

Emergency lighting

Emergency lighting is usually installed in escape routes to show the way to exits and to illuminate them. The Building Code specifies where and when they are required.

The lights are powered either by a specially protected wiring and central battery system or by the local power circuit, with individual batteries and recharging units installed in each light. The latter is more common.

Each light is fitted with a small LED (light emitting diode) to indicate that the unit is functioning correctly. The light changes if there is a malfunction.

Intrusion alerts

There are a number of ways to detect unauthorised entry, including:

- movement sensors
- heat sensors
- video display
- video display with recording when movement is detected
- glass break sensors
- door sensors

Professional advice should be sought to establish an easy routine to locking the building and arming surveillance mechanisms. Alarm systems can be "armed" (switched on) by key, by cipher pad, by magnetic card, or by remote control.

Alarms can be audible or inaudible at the point of entry. The signal may be remote, such as at a caretaker's cottage by means of the phone lines. An automatic dialler may be activated to ring the home or homes of senior personnel, a security firm or the police.

The planning team, particularly the users, should consider the degree of need for security/surveillance and advise the designers accordingly.

Malfunction alarms

Alarm systems may be needed for:

- crucial air-conditioning systems
- sewerage pumping systems

If critical equipment fails, leading to damage of products or services if the malfunction persists, then sensors should be installed to provide alarm signals, which work more or less as in intrusion alerts (described above). Plan to have the signals located in areas where staff can monitor them.

AiS
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School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

MANAGING THE CONSTRUCTION PROCESS

6

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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1	Introduction and Chapter 1 – Developing a Master Plan
2	Chapter 2 – Making the Most of Your School Site
3	Chapter 3 – Principles of Good School Building Design
4	Chapter 4 – Purpose Designed Facilities
5	Chapter 5 – Construction Methods and Materials
6	Chapter 6 – Managing the Construction Process
7	Chapters 7 and 8 – Technology and Managing Buildings
8	Appendices

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

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6

Managing the Construction Process

6. School Facilities - Managing the Construction Process

This chapter covers the issues pertaining to:

- the appointment and management of professional consultants (6.1)
- tendering - the various ways of contracting (6.2)
- forms of contract (6.3)
- project and construction management (6.4)
- time management (6.5)
- budget control (6.6)
- managing change to the contract (6.7)
- post-contract management (6.8)

It would be unusual to find within any school organisation, people with sufficient skills and time to properly design, manage the construction process and bring a building project to fruition.

Staff enthusiasm to engage in a new activity should not be allowed to interfere with their commitment to their regular workload. Volunteers are not likely to have the time, over the long haul, to complete even a fairly simple project. Any difficulties which might emerge are likely to jeopardise and sour long-standing relationships. It is often more constructive to use such willingness and availability in a consultative way.

....managing the construction process, appointing professional consultants, budget control....

The Planning Team will need the support of professional construction teams which bring together all the skills necessary to construct the physical environment of the school: the underground services, the foundations, the playing fields or the buildings.

The various forms of contracts are covered, as well as the concept of project or construction management. And finally, post contract management is covered – what happens after the builder has left and problems arise, how do things get fixed?

6.1. Consultants - appointment and management of consultant teams

The professional consultants related to the construction process include architects, quantity surveyors, electrical and mechanical engineers, structural and civil engineers and hydraulics engineers. In certain cases traffic, acoustic and landscape consultants may also need to be employed.

In sections 6.1.1- 6.1.3, a more detailed list of the various kinds of consultants and their role is given. (See also Appendix 9.15)

Professional builders and project managers also can provide valuable advice to planning teams.

The expert advice provided by construction consultants is often available in the early stages on an honorary basis, particularly to schools in their infancy from firms keen to establish a professional and long term relationship.

Advice given in this way should be treated with respect as professionals are not able to relieve themselves of professional responsibility by the honorary status. In any case, a consultant is unlikely to be able to provide such advice for a sustained period without compromising his or her practice financially. For this reason fees should be agreed on at an early stage as a basis for an ongoing relationship.

The consultant is expected to provide certain professional services in return for adequate remuneration commensurate with the value of the advice given and also with the professional liability the consultant incurs in giving such advice.

Keep in mind that the primary role of the various consultants is to provide advice, not make decisions. Consultants will of course make decisions within the confines of their discipline. They will also make decisions when specific delegation is given.

School councils and their representatives must understand their leadership role in the decision making process. School councils should avoid either allowing or forcing their consultants into that role by default. When this happens the benefit of expert consultant's advice is often minimised as not all facts are available to the consultant in every instance and decisions may be made using a different set of priorities.

6.1.1. Head Consultant

The head consultant is usually an architect who manages the other specialists.

In some projects, a project manager is appointed to this role. In this event, the architect will often continue to coordinate the work of specialist consultants (e.g. engineers) with regard to the building and site. The project manager might manage the costing professionals (quantity surveyors, traffic engineers), consult with authorities and manage the general day to day building program.

The head consultant oversees and manages the total consultative process. The construction process would be managed by a builder or construction manager (whose job may be separate from that of the project manager).

Architect

Once the decision is taken to construct a building or even prepare a Master Plan the appointment of the architect is one of the most important decisions in the process .

The two major tasks of the architects are:

- to conceptualise the facility in such a way that it will best serve the educational program
- to lead the design team in designing and constructing the facilities.

The architect should be able to:

- demonstrate the ability to design according to the client's brief
- produce designs within budget
- produce creative solutions to problems presented by difficult sites, constraints of council requirements, neighbours objections
- maintain time schedules

Methods for appointment of architects

There are a number of ways a school council can go about the appointment of an architect or architectural firm.

Design Competition

This method involves selecting a number of architects and inviting them to submit proposed solutions to a particular task (e.g. an Outline Master Plan) based on a draft set of criteria.

The school should pay a fee to each competing architect with the successful architect being appointed to the project. This option is more attractive and fair as there can be considerable costs involved in preparing even a notional Master Plan. Built into such an arrangement should be the potential for using ideas presented by any of the architects in the final scheme. In this way the additional expenditure can be more easily justified.

If no remuneration is offered (apart from the potential of securing a commission) the more experienced firms may not compete - thus the school may not secure the best professionals available.

If a design competition is to be held, a school representative should approach the relevant chapter of the Royal Australian Institute of Architects for advice, assistance and guidelines for such competitions, otherwise there may be some limitation on Institute members being involved.

Direct Appointment

This is the usual method of appointment and occurs where a firm of architects is known or recommended because of their expertise and experience.

A possible down-side of this method is the tendency to use old and tired solutions to new problems - younger and more enthusiastic and possibly more creative professionals are less likely to secure commissions in this process. Firms of architects overcome this by bringing in to their firms new experience and appointing them to operate alongside experienced architects.

Comparative Selection

This is probably the most useful and reliable method of appointing an architect. It involves establishing a range of criteria on which firms are evaluated, and inviting firms to present submissions responding to those criteria.

By this means, the various skills can be assessed and the most appropriate firm selected.

The criteria usually includes:

- demonstrated design skill
- ability to perform to program
- capacity to design within budget
- capacity to lead a team of professionals
- capacity to work with client (in this case the school)
- current work load in relation to available staff
- "after sales" service -follow up of problems once the building is occupied

As supporting evidence for the statements, architects should be requested to provide references from present and former clients. A form prepared using the above criteria would assist the referee to comment.

Project Manager and Construction Management

For a description of the roles of project manager and construction manager refer to section 6.4.

6.1.2. Appointment of consultant team

The team of consultants may be employed either directly by the school or through the head consultant. In either case, coordination of the team should be included in the responsibilities of the head consultant.

Some consultants may prefer to give their advice to and be paid directly by their client. This may undermine the head consultant's leadership of the team. In these cases, the school must make clear to the consultants that while payment may be direct from the school, the school will rely on the advice of the head consultant.

A method sometimes employed is to have the head consultant put together a complete package where the responsibility for the appointment, receipt of advice from consultants, and payment all are channelled through the head consultant. In this arrangement there can be no dispute as to who is responsible for the performance of the consultant team.

6.1.3. Types of Consultants

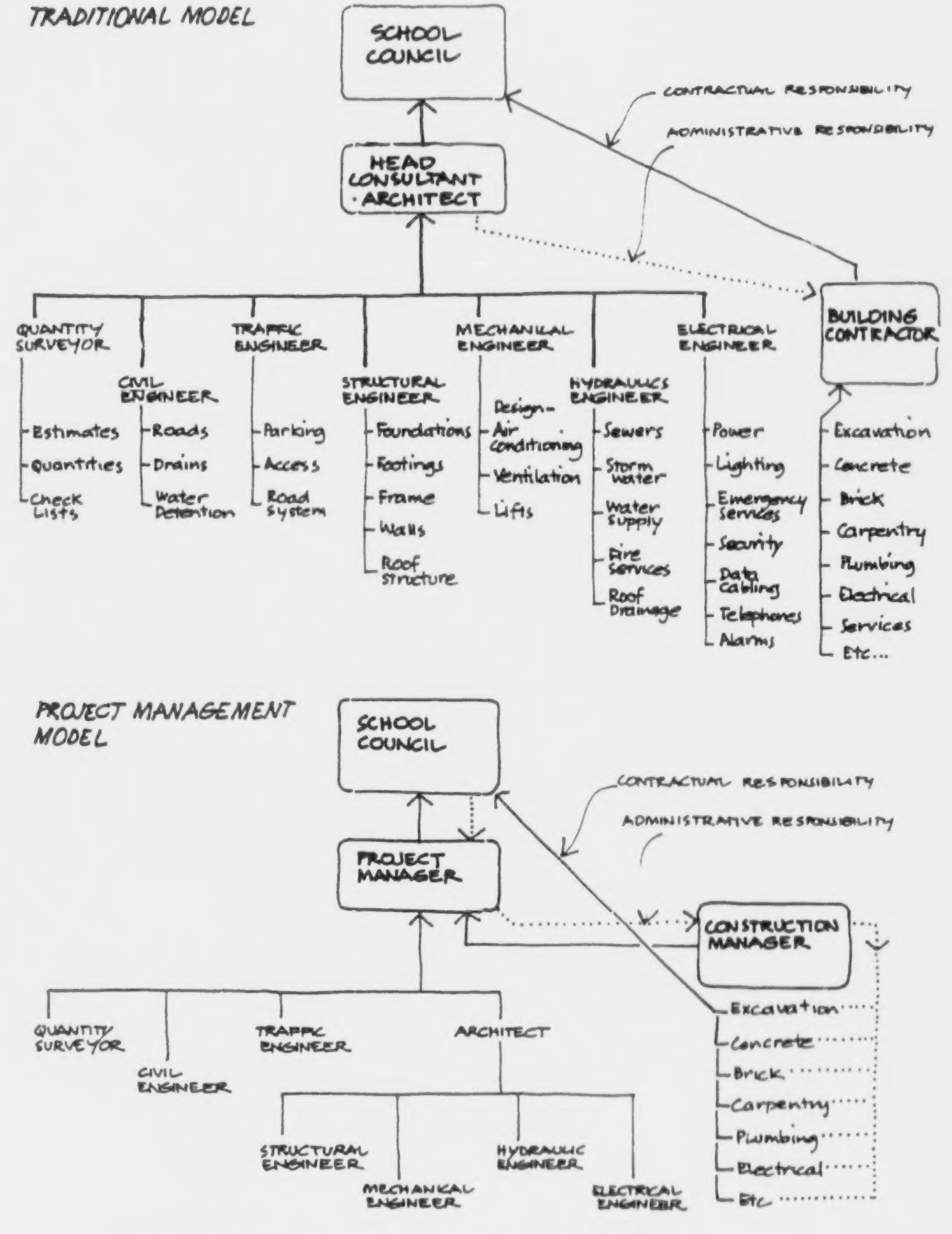
The various consultants that may be employed in a school building project include:

- **architect** - design and construction as well as overall coordination of the project
- **quantity surveyor** or cost consultant - construction costs and cash flow; costs of variations to project; monitoring of the total budget.
- **structural engineer** - structure of the buildings; foundations, framing (steel or concrete); floors and roof construction (particularly where large spans are involved).
- **civil engineer** - roads; major drainage; water retention basins
- **hydraulics engineer** - sewer; stormwater design and construction; water and gas supply; fire services; hose reels and hydrants
- **electrical engineer** - light and power reticulation and equipment including exit signs and safety equipment; special power systems such as uninterrupted power supply (UPS); protected power supply for computer systems; low voltage for technology rooms and DC supply.
- **traffic engineer** - assessment of traffic related to school and to surrounding community (often required as Development Approval stage)
- **acoustics consultant** - environmental assessment; sound engineering in multi purpose halls and music facilities
- **mechanical engineer** - design and construction of ventilation and air-conditioning systems, extraction equipment in technology workshops, food service areas and toilets, lifts and hoists.
- **interior designers** (professionally qualified consultant) - furniture and furnishings; colour; carpet and space planning.
- **library consultants** - methods for storage of books; planning for security of stock; lighting and layout; supervision and access.
- **sports field design consultants**.

6.1.4. Consultant Agreements

The various professional bodies or associations of professional construction consultants have standard agreement forms which cover matters such as responsibilities, liabilities, duty of care, handling of information and communication and the like as well as a basis for fees – often a choice depending on the circumstances.

The school should seek formal submission either to the head consultant or to the school depending on the arrangements to be entered into as to the nature of the contractual arrangement to be entered into by the consultant. Any delay has the potential of dispute which increases as the delay continues.


TRADITIONAL MODEL
SCHOOL COUNCIL
CONTRACTUAL RESPONSIBILITY
ADMINISTRATIVE RESPONSIBILITY
HEAD CONSULTANT · ARCHITECT
BUILDING CONTRACTOR
QUANTITY SURVEYOR
Estimates
Quantities
Check Lists
CIVIL ENGINEER
Roads
Drains
Water Detention
TRAFFIC ENGINEER
Parking
Access
Road System
STRUCTURAL ENGINEER
Foundations
Footings
Frame
Walls
Roof Structure
MECHANICAL ENGINEER
Design-
Air Conditioning
Ventilation
Lifts
HYDRAULICS ENGINEER
Sewers
Storm water
Water Supply
Fire Services
Roof Drainage
ELECTRICAL ENGINEER
Power
Lighting
Emergency Services
Security
Data Cabling
Telephones
Alarms
Excavation
Concrete
Brick
Carpentry
Plumbing
Electrical
Services
Etc...
PROJECT MANAGEMENT MODEL
SCHOOL COUNCIL
CONTRACTUAL RESPONSIBILITY
ADMINISTRATIVE RESPONSIBILITY
PROJECT MANAGER
CONSTRUCTION MANAGER
QUANTITY SURVEYOR
CIVIL ENGINEER
TRAFFIC ENGINEER
ARCHITECT
STRUCTURAL ENGINEER
MECHANICAL ENGINEER
HYDRAULIC ENGINEER
ELECTRICAL ENGINEER
Excavation
Concrete
Brick
Carpentry
Plumbing
Electrical
Etc

CONSULTANTS AND CONTRACTING

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6.1.5. Fees

The tasks of the consultancy team usually cover the following areas:

- schematic design (involves very preliminary sketches and costings illustrating general direction of design intention)
- design development – on completion of this phase the design team should be able to commence contract drawings, the design process will be largely complete.
- Contract Documentation – the completion of this phase permits tenders to be called
- Tendering Phase (involves obtaining tenders up to the signing of a contract, and includes the negotiations)
- Construction Phase – the completion of this phase will be the handing over the facility for occupation.

As one example the percentage of the total fee paid on completion of each phase is as follow:

Schematic Design	15%
Design Development	15%
Contract Documents	40%
Tendering and Construction	30%

For example if the total fees amount to 12% of the cost of the project, say $1.5m, at the end of the Schematic Design stage the school will be liable for $27,000.00 in consultants fees.

The fees are usually quoted as a percentage of the total cost and the percentage can vary significantly depending on the current state of the market and on the size of the project. Unless a fixed fee is quoted the final fee will be calculated on the final cost. Allow for this in budgeting.

It is not always wise to choose the lowest fee. Each consultant should be chosen for the demonstrated capacity to carry out the design and documentation process in a competent and efficient manner. A consultant who has some empathy with the school's philosophy and/or the school board and their objectives can be an advantage. Do not, however, rely on this and avoid spending adequate time in briefing the consultant.

For estimating purposes in the initial phases of costing, the overall professional fees for full services, that is from commencement through to completion of the project should be in the order of 12% to 15% of the cost of the project. A word of warning – fees can vary significantly depending on the sizes of consulting firms, the size of the project, the level of service required or offered, the current state of the construction industry and the level of competition and could be in certain instances somewhat lower than that stated below.

As a general guide the fees can be broken down as follows:

Architects	6%
Structural Engineer	1.5%
Mechanical Engineer	1.5%
Electrical Engineer	1.5%

- Hydraulics Engineer 1.5%

These percentages are of the total cost of the building and should be used only for very preliminary estimating. The actual fees are calculated using a percentage based on the actual cost of the relevant work involved.

For example the cost of the hydraulics consultants work may represent 1% of the total cost of $1m project. His fee may be 6% of the cost of the hydraulics work.

If this basis is used to determine the fee, then the various trades should be listed separately in the tender submission so that the appropriate fee can be calculated.

6.1.6. Design reviews

The brief to the consultant as to how the work is to be carried out should include regular review meetings of the design as it is developed.

This should be part of the consultants own requirements in order to maintain clarity in regard to his instructions. A school should be sure to encourage consultants to call regular meetings for reviews of the design process.

6.1.7. Preparation of Brief to consultants

Details of the kind of information that might be contained in a consultants brief is a response to the information provided in chapters 2,3,4,5 and 6.

The consultant's brief is a document prepared by the school to describe what is to be provided in the finished project. It usually covers cost limits and time constraints. The brief is also the instrument by which the performance of the consultant is measured.

It is useful to have at least the head consultant involved in the preparation of the brief to help identify and clarify issues and to eliminate impractical requirements at an early stage.

The consultants should not be allowed to dominate the preparation of the brief as they may hinder a full expression of requirements which could lead to an inadequate response to the real needs of the school.

6.2. Tendering - the various ways of contracting

Tendering is the process of securing quotations for work based on a set of documents which will form part of a contract with the successful tenderer.

The following principles should be observed by schools in order to be fair to all parties and to ensure sound contractual arrangements.

- school authorities should have due regard to the cost of. tendering

- collusion, hidden commissions and secret arrangements should be prohibited
- all tenderers should receive the same information
- if a question is responded to, then all tenderers should receive a copy of the question and the response
- adequate time should be allow for a proper response to the invitation to tender - usually 3 weeks or longer
- all tenders should remain sealed until specified opening time for all
- confidentiality of tenders must be assured
- while it is not necessary for tenders to be opened in public in most cases, sufficient witnesses should be present, representing both the school and the consultants
- proper records of the opening should be made, listing names and prices submitted as well as any conditions
- any parties with a conflict of interest should declare themselves (e.g. members of school boards wishing to tender for projects should resign from the board and/or distance themselves from the selection process completely).

Australian Standards Association sets out guidelines for tendering in AS4120-1994 Code of Tendering.

Should negotiation of conditions be required with any of the tenderers, it is usual for the lowest tenderer to be given the opportunity first to resolve them. If negotiations lead to the price being lifted above that of the next tenderer and that tender is unconditional then it becomes the lowest tender.

If the next tender is also a conditional tender the process must be repeated.

This process can take a considerable amount of time. For this reason you may, with consent of the tenderers, have concurrent negotiations, taking care to preserve the confidentiality of each bid. It is important to refrain from "playing off" one tenderer against the other.

When a building is constructed by the traditional method - that is by inviting tenders and selecting the best (usually the lowest) it will be obvious that the builder can not commence until tendering negotiations are complete.

One of the weaknesses of the traditional tendering method is that the expertise of the chosen builder is not brought to bear on the design until most of the decisions have been made. If the builder makes suggestions regarding construction methods it is difficult for the school to know whether the recommendation is coming forward to save its resources or those of the builder. It is not a serious enough weakness, however, to set aside the traditional tendering process.

6.2.1. Tender Registrations

There are various ways of determining who should be eligible to submit a tender. Tendering can be open - that is anyone who asks for tender documents can receive a copy and submit a tender. An alternative is closed tendering where the tenderers are invited. In this case the lowest conforming tender should be accepted.

An alternative to both the above is to call for registration of name of tenderers along with sufficient details to permit checking of their capacity to do the work and their acceptability in general. The advantage of this method is that the checking (which would be required after tenders closed in open tendering) can be done beforehand. In this form of tenderer selection, the lowest conforming tender should also be accepted.

School authorities should be aware that the preparation of a tender involves a substantial amount of work. Tenderers need assurance that this work serves some useful purpose and that if the effort is made to submit a tender it will be reviewed fairly and not be rejected on a capricious basis.

ICAC (Independent Commission Against Corruption) has prepared a booklet entitled "Pitfalls or Probity - Tendering & Purchasing Case Studies". This incorporates a number of case studies illustrating various aspects of tendering including patterns to avoid. One of these entitled "How Not to Assess Tenders" is incorporated here with permission. This appears on the next page.

11

HOW NOT TO ASSESS TENDERS

A college used a tender process annually to select a "preferred supplier" of personal computers. The successful tenderer got most of the college's computer business for the next year. One supplier had won the tender twice, and its second contract had been extended for a further year. During the three years, the supplier had obtained close to $4 million worth of business through the college.

The college's PC Committee met to develop specifications for the third tender The Committee discussed the ideal PC requirements, agreed on technical specifications and proceeded to advertise Almost 50 tenders were received.

Shortly after tenders closed, the Committee met to decide how to assess the tenders. Considerable time was spent discussing important criteria such as quality of equipment, supplier reliability, servicing, responsiveness to the college's needs, and value for money. However, committee members could not agree how to assess these factors or what priority to give each. Some members felt the location of suppliers (local or city-based) would affect servicing and reliability. The tenderers had not been asked for information on any of these criteria. They had only been required to meet technical specifications and quote a price per PC.

Committee members held such differing views that they decided a formal assessment was impractical To decide on the winning tender, they first eliminated the 25 highest priced tenders (adjusted by the committee to account for differences in hard disk and memory capacity). At a subsequent meeting, the field was reduced again, but the basis for culling was not recorded. Some further information was obtained from some of the short-listed suppliers but it was also not recorded. One of the committee members felt uncomfortable about the lack of documentation and independently prepared a spreadsheet comparing various factors.

Finally the committee members "voted". Each secretly wrote down the name of any of the remaining tenders he or she thought suitable. The current supplier was the only one to appear on all members' lists and on that basis was awarded a further two-year contract with a one-year option.

6.2.2. Department of Employment, Education and Training (DEET) Requirements - Tendering Process

Schools securing a capital grant from the Commonwealth should be aware of their tendering requirements:

- oversight by building industry professionals
- adherence to Australian Standard (AS4120 – 1994) Australian Standard Code of Tendering
- comprehensive documentation as basis for tender
- project completion time stated in tender
- competition to the greatest extent possible for all major elements
- claims for payments to be certified by a competent building professional

Schools participating in a capital grants program will be supplied with the necessary documentation and should ensure guidelines and requirements are adhered to.

6.3. Forms of Contract

This section covers the following three forms of contract and their respective types of remuneration, in view of various controls – most importantly cost control – that the school will want to maintain:

- lump sum (6.3.1)
- rise and fall (6.3.2)
- fixed fee (6.3.3)

6.3.1. Lump Sum

A lump sum contract is simply an arrangement whereby a builder offers to do a specified amount of work for a fixed sum of money. If there are no changes to the amount of work there will be no changes to the contract sum payable by the school. This is rarely the case, however, as most contracts have to be changed for various reasons such as:

- changes in conditions below the ground - foundation changes
- changes to requirements that emerge during the construction phase
- items overlooked in the preparation of the contract documents
- changes in contracts involving renovation work

It is possible to ensure reasonable prices in such circumstances by requiring the tenderers to submit rates for the work where changes might be anticipated such as:

- excavation in soil
- excavation in rock
- the various finishes and structural elements (the consultants will provide a list)

Variations are notorious for causing disputes between a builder and the proprietor. During the tendering process each builder will submit the lowest possible price. If the contract documents are not clear or the cost has been underestimated there may be a tendency for some builders to pursue variations, some vigorously - hence the potential for dispute.

6.3.2. Rise and Fall

Rise and fall contracts involve tenderers' submissions based on current prices with an agreed and recognised formula for calculating the variation in the cost of the project based on certain indices. This method is recommended during times of high inflation.

A number of formulae (with which professional consultants will be familiar) may be applied. As they are usually very technical and detailed, they will not be described in this document. Often, Quantity Surveyors are required to complete these fairly complex calculations.

In times of low inflation, the lump sum form of contract is preferred. However, when inflation and building activity are running high, tenders for lump sum contracts will include an estimate of inflation to compensate the builder for increases in cost. This estimate is likely to be higher than actual cost increases. Therefore, when costs are increasing rapidly, a rise and fall formula is preferred because it provides a precise method of determining the increase in cost to which the contractor is entitled.

6.3.3. Fixed Fee Contracts

Where the cost of a project is indeterminate, fixed fee contracting provides for reasonable controls on costs. The fixed fee is the amount paid to the project manager for the work of completing the project. The fee remains the same irrespective of the cost.

Fixed fee contracts allow for incentives for the project manager to minimise cost, to complete the project on, or ahead of, schedule and within budget. Provided there is a good basis for trust and a good performance reputation, this is a reasonable basis to carry out a project.

A list of typical contractual documents is provided in Appendix 9.14.

6.4. Project and Construction Management

A project manager or project management company is often responsible for the total design and construction process: from the giving of the brief (may even be involved in the preparation of the brief) to the handing over of the building to school, after the completion of the defects liability period. Thus, the project manager is usually appointed very early in the process.

The main advantage of using a project management approach, rather than an architect and builder, is that the school can ask for a one-off total fixed-price contract not subject to variables, for the whole project.

The project manager may continue an involvement past completion into the management of the facility, although this is unusual in schools where facility management is undertaken by those associated more intimately with the school.

The project manager should have a wide knowledge of the building industry, experience in handling the wide variety of trades, as well as the various authorities such as the local council, water and drainage authorities.

The project manager should also be skilled in managing a team of professional consultants and be able gain their respect and cooperation.

Construction Manager

A construction manager takes the place of a builder and, therefore, is associated only with the actual construction process. Once the contract documents are signed, the construction manager oversees the appointment of contractors and coordinates their work.

The construction manager may commence work once the contract is in effect, to ensure that documents for the calling of the various contracts are prepared in the most advantageous way.

The project, if large, often warrants the employment of a project and/or a construction manager. In some cases these are the one and the same. The project manager is engaged to oversee the whole project for the client including the engaging of and managing the team of professional consultants. The role of the construction manager is to manage the construction phase of the work.

If the project is relatively small a school council may elect to undertake the role of project manager - usually by delegating the responsibility to a building subcommittee but this is recommended only where the committee has adequate expertise and knowledge of the construction industry.

Alternatively a builder may be engaged to be the construction manager.

While cost savings can be an aim of adopting a construction management model, i.e. to eliminate the builder's profit margin on subcontracts and reduce the cost of supervision this can only be achieved if the person replacing the builder can carry the responsibility and perform adequately for less cost.

This model should only be undertaken with due care, as often the anticipated savings can be offset by poor decisions made due to lack of experience. Volunteer or inexpert consultants should not be expected to sustain adequate input over the period of a building contract. Problems to guard against which could offset possible savings include:

- poor programming - trades not being available at the right time creating costly delays
- poor coordination of the contracts and work being omitted from two sequential contracts e.g. the blinding layer over-fill under a concrete slab on ground
- core holes not being left for services
- electrical conduits not being laid in time for concrete pour

Some BGA's have established guidelines for those intending to seek approval from the Commonwealth in projects with Government Grants in the use of Project Management. The Association of Independent Schools NSW Capital Grants Committee has prepared one such guideline document. A summary will be found in Appendix 9.12

6.5. Time Management

Managing time involves:

- establishing an overall program, including all major events such as approval of brief, local authorities approvals and letting of contract
- modifying the program as necessary to accommodate unforeseen developments
- making proposals to adjust for lost time
- gaining the cooperation of various agents and consultants in maintaining momentum
- preparing and circulating modified programs to all involved

There are a number of computer programs which facilitate the preparation of schedules. It would be appropriate to insist that the chosen managers have experience in the use of these, alternatively can demonstrate a capacity to maintain such a program over the course of a project.

6.6. Budget Control

Budget control commences at the inception of the project and continues with increasing refinement to the end. It requires having sufficient information and tools to make informed decisions.

Budget control does not necessarily require acceptance of the lowest cost – spending more money in the early stages of the project may save money at a later time.

Total expenditure can be monitored continually against estimates. Decision makers are then in a position to implement cuts (where the budgeted cost estimates have been exceeded) or to allow additional expenditure (where savings make it possible).

Computer technology and appropriate expertise make budget control an easily manageable task. However, adequate funding should be allowed in budgets for professionals to undertake this work.

A computer spreadsheet which lists the various facets and trades sections of the project and the variables enabling regular review of anticipated final cost is necessary for effective budget control.

To emphasise the importance of careful management the following excerpts from "Size, Cost and Creativity within Commonwealth Guidelines" has been reproduced with permission. It is from an address to the National Seminar of BGA Officers, November 1981 by Geof Nairn and Tom Heinrich. The address covers a wide range of issues and would be valuable information for the Master Planning Team.

A copy is available from the author.[1]

- *"Schools of the future have to operate more like a business enterprise in the sense that their growth, upgrading, operating costs and "return" have to be "professionally" managed."*
- *"...the cost of a proper development strategy is most likely to be covered by the savings it produces in the very first stage."*
- *"The longest lasting buildings, with the least need for ongoing costs for maintenance and replacement, attract higher initial cost."*
- *"...to approach guideline cost (Commonwealth Guideline costs) decisions regarding choice of materials are often made that are not in the building owner's best interests....domestic aluminium windows with far higher maintenance costs.....cheaper floor finishes which wear out much faster...."*

6.7. Managing Change to the Contract

Changes are inevitable – some common reasons include:

- change in requirements of client
- requirements of authorities
- costs over-runs
- unexpected events and circumstances, such as prolonged inclement weather, unexpected underground conditions or services
- unavailability of materials

Some of these possible changes may be factored into contracts so that the school is not liable. In so doing the school is in effect paying up-front for the risk the contractor is taking.

The budget should include a contingency sum to cover variations. An appropriate contingency would be approximately 2.5% of the total estimated contract value. Contingency sums need to be managed and should be spent only as explanations are provided.

6.8. Post-contract management

6.8.1. Conclusion of contracts

A building contract is concluded by a series of events which may include:

- Occupation - full or partial, which often coincides with the commencement of the defects liability period
- End of the defects liability period
- End of contractual arrangements for management of service systems included as part of the construction contract
- End of guarantee period for items of equipment required by the construction contract.

The head consultant is usually responsible for administering the contractual obligations of the school and that of the contractor (the parties to the contract). Responsibilities include:

- giving notices at appropriate times
- authorising payments
- listing defects to be corrected
- certifying payments
- giving notices for completing the work, and for correcting the defective work
- providing the required information, such as maintenance requirements.

6.8.2. Records of services

Services layouts

At the very earliest stage of the project the school should advise the Head Consultant to require all contractors, including the main building contractor, to provide "as constructed" drawings and details. These are usually based on the contract documents and include all changes that have been made for whatever reason, for example, client change, changes due to authorities, changes due to unforseen circumstances (underground water courses affecting foundations).

All services, particularly underground services should be clearly identified both as to type of service, direction of flow, depth below datum (an assumed level related to some permanent feature, not ground level as this can change over time) and horizontal distance from permanent features.

This information, with computer aided drafting (CAD) technology can be easily updated from contract documents. This information should be obtained as early as possible, even before trenches are backfilled and while those with the information are on site.

Progress photographs are a valuable asset in this regard. Photographs with dates are useful in dealing with disputes that arise.

6.8.3. Post Contract Maintenance

Maintenance manuals

With mechanical services such as air conditioning, comprehensive maintenance manuals should be provided including: drawings illustrating all the equipment and locating all parts requiring regular inspection and maintenance as well as a recommended program for maintenance.

Maintenance Agreements

A one-year free maintenance agreement is commonly included in the tender price. This is sometimes done to attract a long term contract.

At the end of this period, the school should call for tenders based on the recommended maintenance program (after checking with the consultant as to its adequacy) and offer the long term maintenance contract to the lowest reputable tenderer.

Log books of services

For each item of equipment, a log book of service provided should be kept, including the following:

- date of service
- a brief description of the work carried out
- kind of service, whether routine or emergency repair
- person carrying out the work
- time and date of arrival
- time and date of departure
- signatory of appropriate school representative (for authorising accounts payable)

The consultant and or contractor sometimes establishes the format of these log-books.

Not all the above information is in the interest of the contractor, but nevertheless is important to the school and, therefore, should be kept up to date.

Maintenance program

Three main areas of maintenance are:

1 Buildings
2 Grounds
3 Equipment

Buildings

A long-term maintenance program should be developed by every school; it will incorporate regular repainting, inspection of roofs, inspections of sealants in external junctions exposed to weather, etc. (See check list - Appendix 9.15)

Procedures and information relating to emergency repairs - initially, try to use contractors who carried out the work, provided that a good relationship exists and that their work was satisfactory. Include personnel, phone and fax numbers, account details. It may be appropriate to establish rates for certain types of work, for example hourly rates for attendance based on tenders for maintenance work.

Grounds

Programs for:

- regular cutting of grass lawns
- replanting of gardens
- planting of trees
- fertilisation program
- weed control (avoid during and just before term time as some residual problems apply to some forms of control)
- checking of drainage systems, removal of debris from drain sumps
- fences
- hard court surfaces
- roads, ensure cracks in pavement are sealed promptly
- pathways

Equipment

Programs for maintenance of:

- air-conditioning installation including cooling towers, particularly if water type
- sewerage pumping facilities
- emergency lights and batteries
- vehicles
- stoves, lathes and other large equipment items in TAS areas in particular

While not part of the building process, it is worth mentioning that schools commonly upgrade or expand their equipment stock. A school will be well served if a program is put in place to ensure that future maintenance is appropriately scheduled and provided for equipment such as photocopiers, faxes and educational equipment

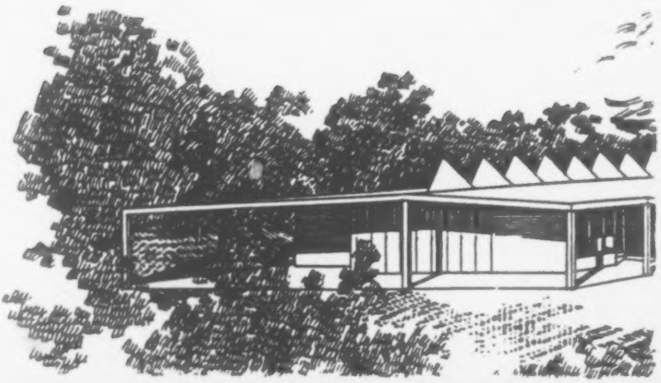
6.8.4. Asset Management

For comprehensive help in asset management, schools will find much help in the Total Asset Management Manual published by the New South Wales, Public Works Department, Policy Division.

The manual contains articles on Economic Appraisal, Value Management, Post Completion Reviews, Capitalisation Guidelines, Risk Management, Life Cycle Costing, Asset Register Guidelines and Energy Management.

There is a companion manual equally informative referred to as the Capital Project Procurement Manual. This manual deals with Codes of Practice, Tendering in relation to construction projects, Various aspects of the culture relating to the construction industry such as quality assurance, Relationship management such as Contracting, Planning in particular relating to the construction program and Management of the construction consultants.

These Manuals can be obtained through the NSW Public Works Department, Asset Management Policy Unit, McKell Building, Rawson Place, Sydney. Phone (02) 372 8877.



School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

TECHNOLOGY AND EDUCATIONAL BUILDINGS and RECORDS FOR MANAGEMENT OF BUILDINGS

7

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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

- 1 Introduction and Chapter 1 – Developing a Master Plan
- 2 Chapter 2 – Making the Most of Your School Site
- 3 Chapter 3 – Principles of Good School Building Design
- 4 Chapter 4 – Purpose Designed Facilities
- 5 Chapter 5 – Construction Methods and Materials
- 6 Chapter 6 – Managing the Construction Process
- 7 Chapters 7 and 8 – Technology and Managing Buildings
- 8 Appendices

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

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7

Technology and Educational Buildings

7. Technology and Educational Building

At the heart of the technological revolution in education is the computer and related resources, such as worldwide information networks (Compuserve, Internet) and data transfer, hard wire, optical fibre and microwave link systems.

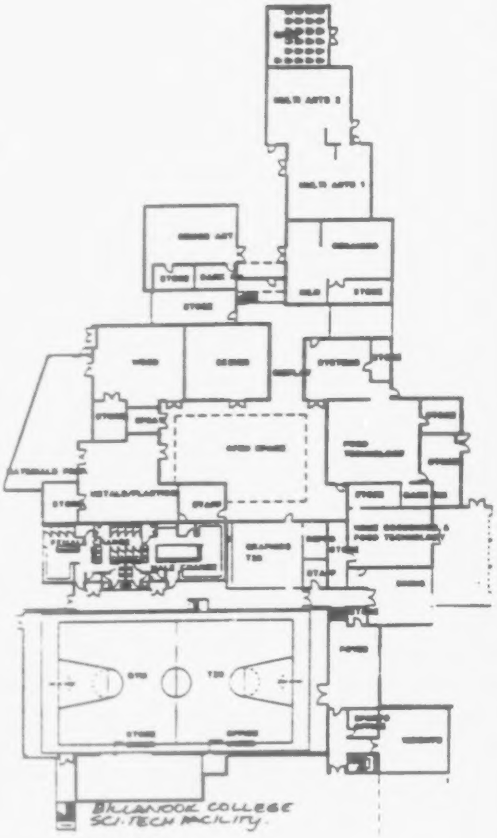
Schools need to prepare students for a world which is increasingly relying on computer technology. Students' academic work will involve computers and probably their future employment will involve computers whether directly or indirectly.

There are a number of questions for educators to address, but the one we are concerned with here is: how should educational buildings be designed to permit technological change with efficiency and minimum expense. Issues covered in this chapter are:

- Computers and buildings (7.1)
- Industrial technology (7.2)
- Integration of technology and other disciplines (7.3)
- Special requirements (7.4)

> *Designing schools for introduction and teaching of the new technologies.......adapting to change.*

The increasing effects of teaching on the school curriculum in recent years is already impacting on school facility design and/or the use and types of equipment schools are having to purchase.



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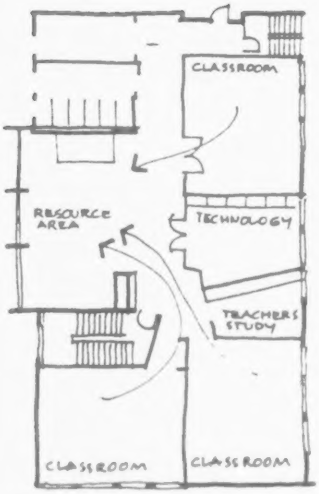
ARCHITECT
PETER G LYALL & ASSOCIATES

7.1. Computers and Buildings

Computers are having an impact on schools in a variety of ways. The following will be covered in this section:

- impact of computer technology on school buildings (7.1.1)
- Support and maintenance facilities and Services (7.1.2)
- support equipment for computers (7.1.3)
- furniture for computers (7.1.4)
- room design for computers (7.1.5)
- power supply for computers (7.1.6)
- data handling (7.1.7)



AN EXISTING BUILDING ADAPTED FOR COMPUTERS
FROM REDEFINING THE PLACE TO LEARN
SUSAN STUEBING . OECD - CETA. ADELAIDE
1994

7.1.1. Impact of computer technology on school buildings

The emerging new technologies are requiring different types of spaces in schools. This can range from stand alone computer education classrooms to additional storage space.

Computers are not only being used for data storage and retrieved through sophisticated resource centres, but also as a direct tool in specific subjects (e.g. Technology and Applied Studies (TAS) requiring specific software (e.g. CAD).

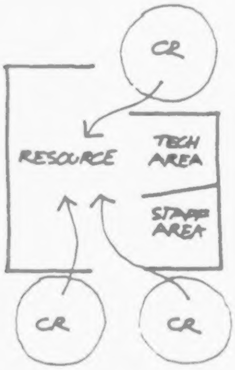
Classrooms need annexes for students to sit at computer terminals, for recharging batteries of lap-top computers, for printers and paper storage as well as related equipment such as file-servers and computer-based visual aids and visual aid equipment.

The lighting quality of computer rooms should be low subdued and the room finishes low-key in colour and non-reflective to minimise distracting reflections on computer screens. Wall floor and ceiling finishes, the kind of light fittings, mechanical ventilation/air-conditioning, acoustics are also areas of special consideration and will be dealt with in greater detail further on in the document.

The security aspects associated with computers must be given a high priority as modern equipment is very portable and vulnerable to damage and theft.

The changing emphasis in the teaching of technology subjects will have an impact on the building. Buildings will have to provide

- greater individual enquiry and experimental investigation
- individual focus of study for students particularly at senior levels
- a collaborative approach with teachers guiding students, require
- a room layout which allows free movement
- an individual work environment for discussion, without unduly disturbing other students.



7.1.2. Support and maintenance facilities and Services

As computer numbers grow so will maintenance problems. Some of these can be resolved by a reasonably skilled teacher (provided an equipped and dedicated maintenance workshop is available). The maintenance workshop can be part of the overall program of learning for students. While it will remain a place principally for staff, selected students with an interest in a career in computers should be encouraged to use such facilities. The design of the room would need to allow sufficient space for this.

Regular access to repair and maintenance facilities will be required for modification and upgrading to cope with rapid change in the technology available to schools. This is dealt with in more detail in 7.1.7 Data handling and management.

7.1.3. Support equipment and services for computers

In supporting the provision of computer hardware the following equipment needs to be provided and accommodated:

- Printers need to be provided where they are readily accessible to students yet protected from vandalism and theft. Annexes close to or part of computer teaching staff areas is one possibility.
- Battery chargers: schools requiring students to have lap-top computers need to provide secure storage for these and as part of that storage, power outlets to allow for battery recharging.
- Telephone links: students learning to use external data banks will need access via telephone lines. In most cases this will be via the school computer network. Nevertheless planners need to be aware of the additional telephone line capacity that will be required. In some cases the system may require higher level of communication via what is known as Integrated Services Digital Network (ISDN) rather than the standard telephone network known as Public Switch Telephone Network (PSTN)
- Visual aid equipment: increasing sophistication in computers allows greater variety in visual display apart from the computer monitor e.g.
    - ✓ Attachments to overhead projector: which allow the projection of a computer screen for classroom instruction.
    - ✓ Video projector: which converts the computer screen image direct to a video image for projection to a wall screen.

7.1.4. Computer Furniture

Furniture needs throughout the school will be different where computers are to be used. When selecting furniture for computers, planners should take into account:

- the need for power and data cabling to each student workplace (unless students are to rely on lap-tops)
- ergonomic aspects of furniture - correct height and slope of desks, preferably adjustable with adequate support for arms and wrists. Quality chairs, preferably with back and seat adjustment (gas-lift for height adjustment). Standard

classroom chairs are NOT suitable. Professional guidance should be obtained.

- subdued furniture colour to complement the colour scheme of the room
- cabling requirements - need for linking together the furniture in a safe way for power and data cabling

7.1.5. Planning for Computers

When planning for computers, the following aspects of the building should be taken into account:

- will separate computer education rooms be built or will computers be integrated into classrooms
- are supplementary spaces required in or near specialist areas e.g. design rooms in technology areas
- will small annex rooms be constructed to house computers - with ready access to the classroom
- how flexible in design should these rooms be?
- how are computer rooms to be supervised?
- security and storage of equipment after hours
- lighting (different to classrooms)
- spaces capable of being used by more than one class
- storage for software

7.1.6. Power supply for computers

Uninterrupted power supply is very desirable for computer rooms. This can be achieved simply by running the system from a battery and having those batteries on continuous charge, instead of connection to the main power system which is subject to power surges in the power lines.

A less expensive alternative is to have a small battery system capable of "clicking in" when power is lost but with sufficient power capacity only to sound an alarm and to permit closing down the system.

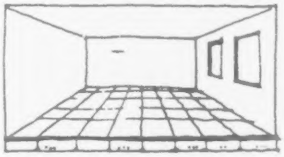
If the above alternatives are considered too expensive some means of protecting the power supply from the "spikes" or surges in power which occur as a result of faults in other equipment, lightning strikes and the like, should be installed as the barest minimum of protection for the computer equipment.

7.1.7. Data handling and management

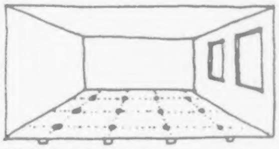
The process of managing data systems in buildings calls for: more space, different kinds of service spaces and more convenient access to cables and junctions.

Rooms which require significant cabling for data systems may be designed using one of the following options:

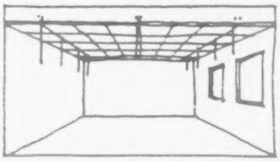
- ceiling grids
- underfloor grids
- floor trunking



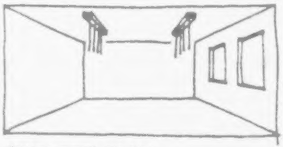
RAISED FLOOR



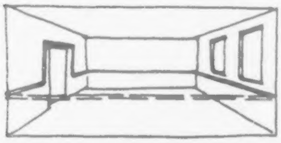
FLOOR TRUNKING



SUSPENDED CEILING/CEILING GRIDS



SUSPENDED BOOM



PERIMETER WALL TRUNKING

CABLE MANAGEMENT
OECD REPORT. PARIS 1990.

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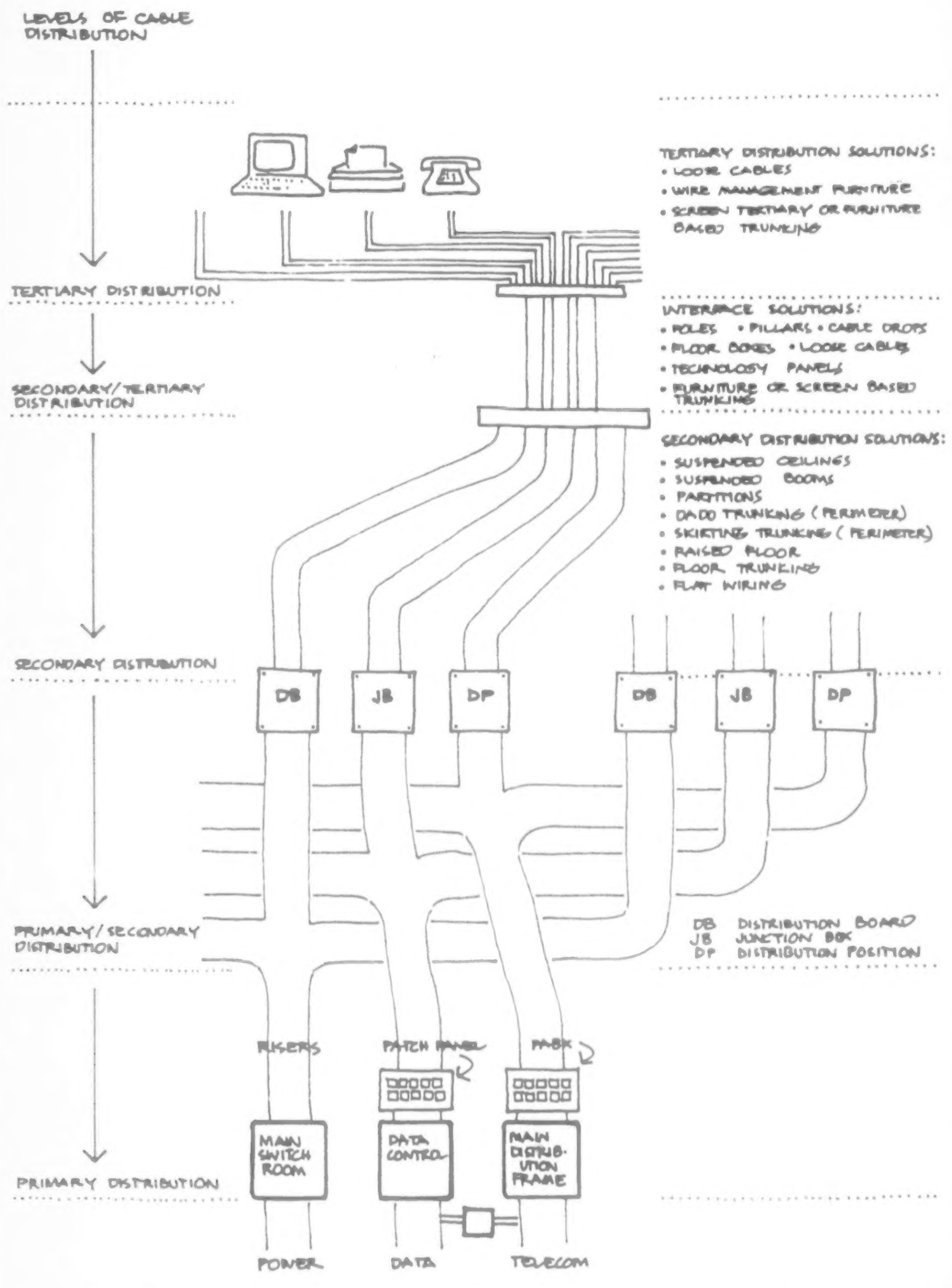
LEVELS OF CABLE DISTRIBUTION
TERTIARY DISTRIBUTION
SECONDARY/TERTIARY DISTRIBUTION
SECONDARY DISTRIBUTION
PRIMARY/SECONDARY DISTRIBUTION
PRIMARY DISTRIBUTION
TERTIARY DISTRIBUTION SOLUTIONS:
• LOOSE CABLES
• WIRE MANAGEMENT FURNITURE
• SCREEN TERTIARY OR FURNITURE BASED TRUNKING
INTERFACE SOLUTIONS:
• POLES • PILLARS • CABLE DROPS
• FLOOR BOXES • LOOSE CABLES
• TECHNOLOGY PANELS
• FURNITURE OR SCREEN BASED TRUNKING
SECONDARY DISTRIBUTION SOLUTIONS:
• SUSPENDED CEILINGS
• SUSPENDED BOOMS
• PARTITIONS
• DADO TRUNKING (PERIMETER)
• SKIRTING TRUNKING (PERIMETER)
• RAISED FLOOR
• FLOOR TRUNKING
• FLAT WIRING
DB
JB
DP
DB
JB
DP
DB DISTRIBUTION BOARD
JB JUNCTION BOX
DP DISTRIBUTION POSITION
RISERS
PATCH PANEL
PABX
MAIN SWITCH ROOM
DATA CONTROL
MAIN DISTRIBUTION FRAME
POWER
DATA
TELECOM

PRIMARY, SECONDARY & TERTIARY CABLE DISTRIBUTION

FROM OECD REPORT ON SEMINAR PARIS 1990 · ROGER CLYNES

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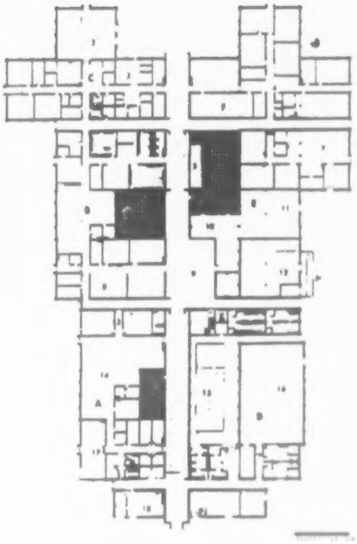

1 Music
2 Drama
3 Nursery
4 Science
5 Greenhouse
6 Court
7 CDT
8 Business studies
9 Cafe
10 Dining
11 Kitchen
12 Physical plant
13 Computing
14 Resource center
15 Pool
16 Gymnasium
17 Staff
18 Administration

Major Suites

A - Administration and library
B - Business Studies, Art and Home Economics
C - Music and community area
D - Physical education
E - Technical studies dining and physical plant
F - Sciences

NEW LEITH ACADEMY
EDINBURGH, SCOTLAND.

Ceiling grids are unsightly, but quite accessible and economic. Underfloor grids are closer to where the information is required and are very accessible, but expensive and vulnerable to damage from spillage in areas where this is a consideration (e.g. science areas). Floor trunking is very accessible but also expensive and more appropriate for the commercial environment.

Other forms of cable management include:

- raised floor
- suspended boom
- perimeter trunking

In "Redefining the Place to Learn" [1]the author says of New Leith Academy, Edinburgh, Scotland. "The design of this 'school of the future' features four key elements: (1) a modular system provides flexibility for change; (2) an internal 'street' facilitates community access, ease of circulation and energy efficiency; (3) provision for the increasing use of information technology is included; and (4) reference to vernacular architecture to humanise the scale of the building."

The main building components are arranged around a main "street": an enclosed space providing a main thoroughfare with a second storey providing for delivery of power, networking and environmental system. Maintenance and modifications can be carried out with minimal impact on day to day activities.

Other multi-storey schools provide for a crawl space under each floor for the same purpose.

These are quite expensive solutions if introduced solely for data transfer systems. They can be cost effective if the spaces provided for computer cabling are used for other services such as air-conditioning, plumbing, power cabling as well as access generally.

A simpler solution involves ducting or vertical trays to which cables are wired. These can be covered or exposed. Covered, they appear neater, but are vulnerable to overheating, build-up of dust and provide a "cosy" environment for rats and mice - a threat to cable systems.

Networks

Networks are cable systems linked to computer equipment to handle the transfer of information or data as it is usually referred to from data banks either within or outside the school.

External data sources are accessed via telephone lines or microwave links. In the case of the latter, space must be designated for the microwave dish, adequate structural support must be available for the antenna as well as access for personnel involved in maintenance and installation.

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[1] *Redefining the Place to Learn - a Study of Technology and the Design of the Learning Environment by Susan Stuebing - New Jersey Institute of Technology. OECD PEB LETA 94*

Microwave links

Microwave links are part of communications networks involving microwave signals between antennae usually mounted on roofs of buildings. They rely on direct "line of sight" to be effective. They emit radiation which is highly dangerous to the human body so care must be taken in locating these away from student reach or exposure.

7.2. Industrial Technology

Industrial technology is an area of education undergoing rapid expansion in the curriculum as well as in the need for increasingly sophisticated space and equipment.

7.2.1. Disciplines

Students today are exposed to and have hands-on experience in the following disciplines:

- Drawing - Computer-aided design
- Electronics
- Pneumatics
- Plastics
- Metal
- Wood
- Food technology
- Textiles and Design

Such wide ranging technologies require sophisticated facilities and are generally best served in purpose designed buildings.

Where existing schools are embarking on a program to upgrade facilities for these programs some are solving the problem by starting from scratch rather than trying to convert existing buildings.

Some examples of excellence in schools:

- Immanuel College Technology Centre in Adelaide, SA: rooms set aside for computers are adjacent to the workshop areas, highlighting the important link between technology and computers. The high quality and serviceability of the finishes are uniquely compatible with computers. Excellent visibility between nearly all spaces makes the area workable and convenient for both staff and students.
- Technology Centre, Beaconhills Christian College, Packenham, Vic.: While the room layout is more traditional, the facility is noteworthy because of the linking of the sciences, technology and computing in one centre. This design facilitates the use of techniques and equipment as well as the sharing of expertise across disciplines.

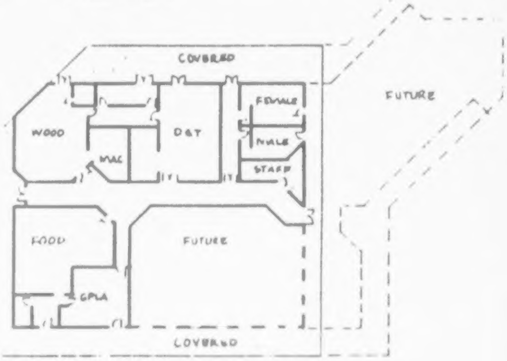
7.2.2. Spaces for Industrial Technology

Given the wide variety of technologies now being taught in schools it is appropriate to provide multi-purpose spaces for technology

STAGING FOR TECHNOLOGY

As the demand for technology spaces grows the school must plan for the appropriate spaces during the growth phase. Here is how Pacific Hills Christian School, Dural NSW has planned for growth in its new technology centre.

Architects A K Werry Pty Ltd and Andrew Blamey in Association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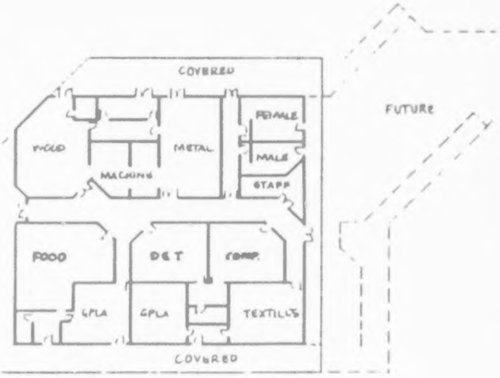
STAGE ONE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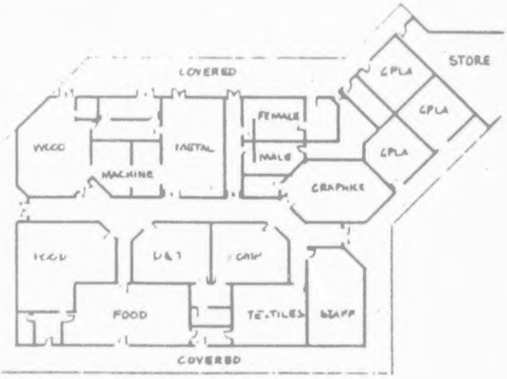
STAGE TWO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TEXTILES
STAFF
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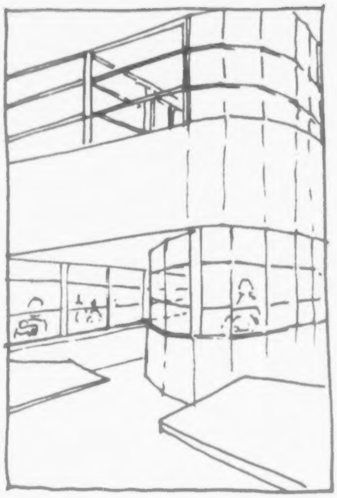
STAGE THREE

studies. The finishes and general services should be appropriate for any of the technologies, and special services specific to any of the technologies may be installed as necessary. This will allow for changing emphases and new technologies with minimum impact to the school building.



IMMANUEL COLLEGE Adelaide
GEOFF NAIRN. ARCHITECT
NOTE: GLAZING ALLOWS EXCELLENT SUPERVISION OF TECHNOLOGY AREAS

General characteristics of these spaces:

- hard and durable floors finished with a non-slip vinyl capable of enduring heavy wheel and point loads
- wall finishes capable of resisting damage from trolleys and tools
- ceilings to absorb sound from machinery and general reverberation
- large access ways for manoeuvring machinery and materials
- good access to stores
- high level of lighting - daylight if possible
- excellent ventilation, exhaust system where fumes are likely
- good access to computer rooms for design work to be carried out in conjunction with the manufacturing process
- good visual access to all rooms from corridors and adjacent study/design areas
- good supervision from staff areas

7.2.3. Services for Industrial Technology

The services now being required in technology areas are quite varied. With these additional services will be a requirement for skilled and competent management of them.

The services include:

- 240V power
- 12V power
- 12V d.c. power
- vacuum lines and equipment
- air pressure lines for pneumatics studies
- oxygen and acetylene for welding
- data cabling (shielded to limit interference from equipment on computers)
- dust extraction system

These services should be installed in such a way that they can be extended to new areas with little difficulty. This may mean including take-offs, branches, junction boxes and certainly markers to assist in locating these services at a later time.

With safety in mind the load on power circuits should be taken into account as fires can easily result from overloaded circuits.

7.3. Integration of Technology and the Visual and Creative Arts disciplines

The visual and creative arts disciplines are becoming increasingly dependent on technology, and in the future, school buildings will have to incorporate greater access to a wider range of the various technologies in teaching these subjects.

Because of compatibility of services and equipment, there is sense in linking technology areas with the Sciences and Arts. Integration permits greater use and less duplication of services and equipment, as well as better utilisation of space.

Given the high services component of arts facilities in schools, the following Creative Arts classes can be integrated with the technology areas with consequent savings and other benefits such as a greater availability of equipment. The savings will come from the use of shared spaces and equipment.

- Computer Art
- Photography
- Sculpture and 3 dimensional work generally involving casting, sheet metal, wire, plastic, moulded and cast and many others
- Painting and Drawing, using wider range of application methods such as spray painting, mechanical drawing, etching

7.4. Special Requirements

This section will cover the technology requirements for:

- storage (7.4.1)
- supervision (7.4.2)
- after hours use of facilities (7.4.3)

7.4.1. Storage

Due to the significant use of equipment and materials in technology rich areas storage is a primary concern for planners. Planners should require of the users a detailed analysis of the various articles to be stored and accessed.

Distinguish between:

- material to be used rarely and that to be used regularly
- teacher and student access.

Upper level storage may be a space-saving solution.

Heavy equipment may require the use of truck access into the store and a hoist to lift it from the truck. Alternatively some delivery trucks have hoists, in which case sufficient space including head room for hoist should be provided for the truck to off-load the equipment and for manoeuvring trolleys.

Rolling shelving (often referred to as "compactus") may be considered to save storage space, however it may not be suitable where student access is required as the momentum of heavy rolling shelves can be a hazard to smaller children. Allowance for increased load must be made in the structural design of floors.

7.4.2. Supervision

Current trends in industry workshop environments provide every possible safety measure to protect workers from injury. In schools safety supervision is even more important because students are less experienced and more inclined to mischief.

Try to plan sspecialist facilities in close proximity to the staff room and where as many as possible of the student areas, including store areas, are visible from the staff area.

An excellent example of this is the Technology Science facility at Beaconhills Christian College, Victoria where the staff facility is elevated and windows provide direct vision to adjacent rooms and to rooms beyond through further windows on the opposite side of the room. Another good example is Emmanuel College, Adelaide where most of the rooms have glass walls above bench height.

Supervision is also possible in sensitive areas by means of television cameras, preferably activated by movement sensor and linked to an alarm system. A sensitive area may be expensive equipment is located, or where volatile or expensive materials are stored. Another is where computer data storage equipment is located such as file servers or network hubs.

7.4.3. After hours use

Maximising the use of the new technologies in schools may mean making them available to the community after hours, requiring:

- independent access without opening up the remainder of the school
- security systems allowing isolation of these areas so that the remainder of the school remains secure
- access to emergency services, telephones, toilets
- access to clerical facilities such as photocopier, separate storage facilities for after-hours users who are engaged in long-term projects.

8

Managing School Buildings

8. Records for Management of School Buildings and Sites

On completion of a building or site development project, the facilities should be handed over from the building contractor to the school authorities in a way that maintenance programs can be properly implemented. This can be done by having a management program for the building services and equipment for a defined period included in the cost of the project. Doing this allows tome for an effective transfer of responsibility from the construction authority to the owner.

This chapter is not intended as an exhaustive study of all aspects of managing school buildings and sites. Instead, it provides tips on responsibilities and record-keeping and advice on how to avoid some of the pitfalls:

- principles of good maintenance and record-keeping (8.1)
- documentation on equipment, services and providers (8.2)

8.1. Principles of good maintenance and record-keeping

Building maintenance is concerned with keeping good visual appearance and useability while fostering a caring attitude among the users and keeping costs as low as possible, both short- and long-term.

> *...planning is required to ensure the completed facility has maximum effectiveness at minimum cost....*

It is important to establish a maintenance policy and regime at an early stage, well before detail design commences as it has a bearing on material selection and the way materials are put together.

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The OECD Document "Maintenance of Educational Buildings, Policies and Strategies" is an excellent resource (see Appendix 9.7).

8.1.1. Essential Maintenance Records

1. As-built Records
2. Detailed Cleaning and Maintenance Record
3. Condition of Premises (updated annually)
4. Priority order of work
5. Cost estimates based on historical data from item 2 above.
6. Maintenance manuals and guarantees

As-Built records

The various construction contracts should require a detailed set of documents to be made available upon completion, showing every aspect of the work, especially the location and depth of underground services in relation to easily identifiable fixed elements of the building.

The relevant consultant should be required to check these documents prior to handing the building over to the school.

Where Computer Aided Drawing (CAD) has been used to prepare drawings it is a relatively simple process to update the working drawings for this purpose. Sometimes consultants offer their services to assist in the preparation of these as-built drawings but it must be emphasised the responsibility for correctness must lie with the constractor.

Schools should also consider asking for the information to be provided in CAD format (for those schools with CAD resources) as well as in the form of drawings as part of the fee and/or contract package. In any case the school should require of consultants in the fee agreements that the CAD records be passed to other consultants should new consultants need to be appointed for any reason.

Detailed Cleaning and Maintenance Records

To properly estimate on-going budgets for cleaning and maintenance, accurate records are necessary.

We are not discussing the day-to-day cleaning, that too should be subject to careful analysis. Rather we are concerned here about those special items such as high-level glass cleaning, roof gutters, drains and sumps, external walls and eaves, ceilings and walls, external paved areas where grime and mould accumulate.

Maintenance will include:

- equipment (usually specified in the maintenance manuals provided with the equipment)
- fume cupboard and exhaust systems
- dust and sawdust extraction systems
- air-conditioning and ventilation systems
- repainting walls and ceilings

- replacement of floor coverings
- external painting
- replanting, weed control and fertilising gardens
- lawn maintenance (fertilising and weed control)
- high level glass cleaning
- roof drainage and ground level sumps
- external paved areas

All of these will require a plan as well as a management program to ensure that this work will be carried out.

Condition of Premises (updated annually)

This report supplements the maintenance program and records and can be used to evaluate the program. It is good policy to have a person other than the maintenance staff carry out this analysis.

Priority order of work

There will be times when maintenance staff are unable to cope with all the work that is required. This is more likely when unexpected crises emerge such as burst water pipes, blocked drains and flooding. Therefore, a priority plan should be available to ensure that essential maintenance (e.g. on equipment) is carried out on time. Neglect of either emergency or essential maintenance may precipitate further costs and delays.

A priority guide will help to determine whether additional assistance is needed.

Cost estimates based on historical data

Properly kept records of maintenance and special cleaning from year to year are a valuable resource in forecasting costs for future years as well as assessing effectiveness of maintenance and cleaning programs.

Maintenance manuals and warranties

Correct and current specifications and maintenance manuals should be obtained for all materials and equipment as quickly as possible. The longer the delay, the more difficult they are to obtain, because equipment and materials become outdated very quickly. The contract should include some requirement for this information to be made available to the school.

The following is a guide to the range of information that should be obtained:

- cleaning and care of floor finishes,
- white boards,
- ceiling tiles in suspended ceiling systems

- carpets, differing regimes apply for synthetic, wool and wool blends
- spot cleaning of floor finishes, especially carpet for the likely range of spillages to ensure damage does not occur in the cleaning process
- cleaning of metal window frames and doors - harsh cleaning agents can damage finishes
- special bench materials such as in Science and food technology rooms

Paint specifications to assist in upgrading programs

Secure from the Contractor a list of all paints and colours including brands and their location (obtain if possible a sample board) to ensure that upgrading paint programs will be compatible with the underlying original paint surface.

This is particularly pertinent where special paint finishes are applied such as in toilets, food service areas and science rooms.

8.1.2. Maintenance funding and operation

The cost of operation and maintenance of sophisticated equipment such as air-conditioning and mechanical ventilation, PABX systems, data systems, is usually significant and should be line item in the school budget. The process is fairly complex and demanding if done properly.

The design consultants can be a useful resource in providing this information but will do so only if requested. There may be a fee associated with providing this information. Contractors may provide this information with a proposal to provide such maintenance on an on-going basis. Information offered in this way should be carefully evaluated by professionals before being accepted by the school.

8.1.3. Collect information on building systems and its performance in use

To properly assess maintenance and performance, on-line data recording equipment can be installed. This equipment will assist in determining whether the system is delivering the service it was designed to do. Information such as temperature of intake air compared to output temperature can be provided as a continuous record.

This information linked with maintenance activities will show the degree to which maintenance assists in design performance.

8.1.4. Move decisions as close as possible to point of effect

This means giving decision-making capacity to those most affected. The more remote the decision makers are from the impact of the decision, the less likely it is to be made. Decision-making power must be linked to accountability.

8.1.5. Training in problem solving

Encourage staff, particularly those involved in maintenance areas and educational staff having maintenance responsibilities to familiarise themselves with the operation of the equipment so that they can correct minor problems themselves.

In this way some expensive maintenance calls can be avoided and users will have a better appreciation of the capacity and limitations of the equipment.

8.1.6. Insisting on quality in school environment

Maintaining buildings and equipment in efficient working order can be greatly assisted by school management insisting on high performance standards with respect to the school in general including, clean and tidy environments, staff rooms and classrooms free of superfluous equipment and refuse, general order and discipline in furniture arrangements, careful management of grounds.

This discipline can then be more easily applied in the areas that are not so obvious; store rooms, maintenance facilities, equipments and mechanical plant rooms.

Untidy facilities make proper maintenance difficult and costly. They discourage excellence on the part of contractors and staff and send wrong messages to students regarding the use of assets.

8.2. Documentation on equipment, services and providers

When a building is complete, the school will require a significant amount of information from the team managing the construction process. The process of completing and moving into a building is often so exhausting and rushed that the provision of this information is often overlooked. If left too long those with the knowledge will have long since left the site and it will be too late to retrieve the information.

Building contracts often require satisfactory performance levels by the various trades persons and the consultants responsible for oversight of the contracts should insist on due performance from trades contractors, particularly in regard to the provision of this information. To this end school councils should insist on a fees agreement which contains clauses that require due performance from the consultants, and in turn from the construction contractors. These requirements include:

- Stamped and approved council drawings and specifications including those pertaining to structure and mechanical services.
- Certificates from supply authorities approving the various installations such as water supply, sewerage, electrical and gas supply.

- Guarantees for all equipment and materials that have been called for in the contract documents
- Operating and service manuals including maintenance schedules for mechanical equipment and systems such as air-conditioning, alarm systems, public address systems, telephone and intercoms, emergency lighting
- Service agreements required as part of the contract
- lists of all contractors and subcontractors employed on the building project with contact names
- As-built drawings of buildings, landscaping and services

8.2.1. Photographic record of construction if required as part of the contract

Photographs taken during construction, carefully dated and related to the minutes of site meetings will assist greatly in future management of the building.

This information will make the task of locating underground services, prevailing ground conditions (rock under the surface), construction methods used, materials as part of the substrate (e.g. thickness of concrete or levelling screeds under floor finishes) easier at a later date.

When taking such photographs it is important to include in each picture some means of identifying the objects with something that is likely to be seen in the completed building, for example a corner of a wall, a door frame, a vent pipe.

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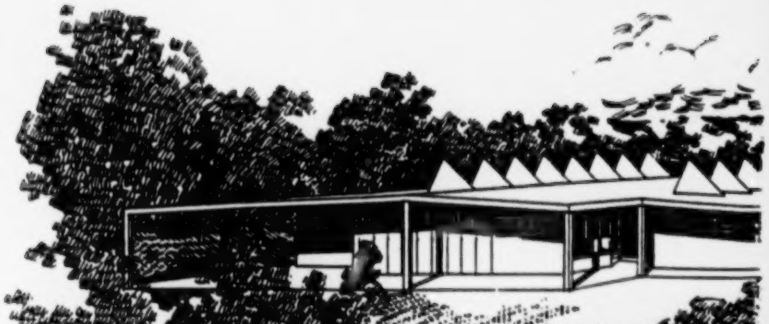
NSW



School Buildings

Planning, Design and Construction

John H Odell FRAIA ASTC
in association with the
Association of Independent Schools of NSW Ltd

8

APPENDICES

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School Buildings, Planning Design and Construction is presented in a ring binder with 8 booklets. The document is available only as a complete set

1 Introduction and Chapter 1 – Developing a Master Plan
2 Chapter 2 – Making the Most of Your School Site
3 Chapter 3 – Principles of Good School Building Design
4 Chapter 4 – Purpose Designed Facilities
5 Chapter 5 – Construction Methods and Materials
6 Chapter 6 – Managing the Construction Process
7 Chapters 7 and 8 – Technology and Managing Buildings
8 Appendices

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School Buildings - Planning, Design and Construction

A Guide Document

for School Councils, Boards and Committees, School Principals and Staff and Construction Professionals

Author - John H Odell FRAIA ASTC

Introduction to

School Buildings – Planning, Design and Construction

Good school buildings do not just happen. Thought and consideration must be given to the needs of the users of the building and to the available resources. The persons responsible for building the school should have considerable experience or draw on the advice of those who have.

For a building to be satisfying and successful it must provide shelter, have durable construction and finishes, be aesthetically pleasing and appropriate to its use. A well-planned school will incorporate the following points:

- buildings and grounds will satisfy and support both short and long-term requirements
- curriculum demands including requirements for registration by authorities will be met
- site development will not be haphazard and each project will pave the way for the next
- building design will be flexible to cater for as yet unknown future requirements
- building will be cost effective - and in the long term the school will avoid unnecessary expensive recovery action
- good building design will encourage a high quality educational environment
- pre-planning of maintenance requirements will assist in reducing operating costs

This guide is designed to assist key personnel in school development projects with the complex task of master planning and construction of schools.

Individual chapters in this guide may be distributed to relevant key personnel as appropriate to their specific interest and responsibility.

Each chapter is a separate booklet with chapters 7 and 8 bound together in one booklet and chapter 9 in booklet 8.

The chapters:

1 Developing a Master Plan for Your School
2 Making the Most of Your School Site
3 Principles of Good School Building Design
4 Purpose Designed Facilities
5 Construction Methods and Materials
6 Managing the Construction Process
7 Technology and Educational Buildings
8 Managing School Buildings
9 Appendices

This Guide aims to:

- demonstrate the necessity for school communities to produce comprehensive master plans for the development of their school
- encourage school staff and boards to be involved in the development of school facilities and to draw on the wider experience of the community during that process
- outline planning processes and techniques that will lead to greater creativity in school design with greater efficiencies and productivity in the construction process
- help school staff and board members in their dealings with professionals in the building industry, and vice versa
- encourage excellence in school facilities
- maximise potential of limited resources to achieve desirable outcomes
- provide advice on how to determine whether a particular facility is vital to a school
- provide examples of excellence in school building and planning
- provide a comprehensive list of contacts, resources and references.

Who should read this Guide:

- All school council/board members
- Principals, bursars and other key staff members
- All members of school building and planning committees
- Administrators in control of school building projects
- Construction industry professionals, especially school architects

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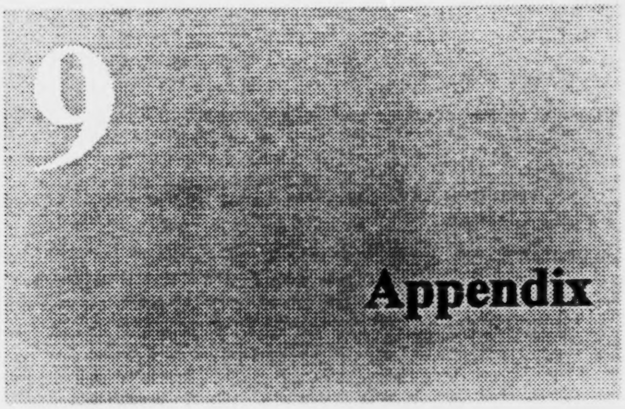


9. Appendix

This part of the Guide Document contains summary statements of important procedures outlined in the earlier sections.

Here is a list of the various appendices:

9.1 Educational and Business Plans - Outlines

9.2 Glossary of terms used here and generally in Building projects

9.3 Block Grants Authorities

9.4 Site Selection Approval Guide

9.5 Value Management resources

9.6 Schools Visited or Forming Part of Study

9.7 References

9.8 Government Capital Funding - Commonwealth

9.9 State Government Funding Schemes

9.10 Byron Bay Sewerage Treatment System

9.11 Anti-graffitti methods

9.12 Project Management Guidelines

9.13 Typical Contract Documents

9.14 Check List

9.15 Construction Consultants

9.16 Financial Consultants

9.17 Contributing Consultants

9.1. Educational and Business Plans – Outlines

9.1.1. Educational Plan Outline

The following is a suggestion as to what might be expected in a typical Educational Plan. The arrangement will not at all be typical, but the essential elements which a Master Planning Team (MPT) might look for are listed. As indicated in the main document the MPT will not need the Plan itself, rather a summary of it as set out in Chapter 1.

The elements:

School Philosophy

The school philosophy normally describes the purpose in establishing the school and how the education process relates to that purpose, the particular approach to education, nature of human relationships and the like. A secular school would have quite a different perspective on the nature of schooling, for example than would a Christian school or a school for Muslim families. This will have a bearing on the kinds of spaces provided and the disposition of those spaces.

School Aims and Objectives

The school should have clearly and succinctly stated aims (goals and general direction) and objectives (specific targets to be achieved within a specified time frame).

Educational strategy

The Educational Strategy will include such matters as curriculum content, school size, class size, teacher student ratio, teaching day, ancillary staff, grade structures (such as whether the school will have divisions according to age, family based groupings, vertical groupings), the proposed availability and distribution of resources and equipment, the degree to which electronic equipment will feature in classroom and support rooms, etc.

The components of the educational Strategy might include the following:

- the instructional plan - the subjects to be included, how courses will be offered and at what levels, (e.g. will students sit the HSC, will alternate pathways to HSC be offered),
- the organisational plan - a system to promote and support the instructional plan, optimum class sizes, style of teaching, organisation of subject matter (e.g. will all topics be taught in relative isolation or will there be an attempt at integrating knowledge and learning as in the Steiner education model)
- the personnel plan - the staff required to implement the instructional program, criteria for selection of staff, programs for orientation
- the evaluation plan - the means of assessing students' performance and of reporting performance to parents

- the support plan - the resources and services needed and available for the instructional plan, (e.g. the levels of technology to be adopted)

The success of the planning process relies heavily on the accuracy and thoroughness of this process. This work is primarily that of the educational professionals but it must be offered in a format for the lay reader. Both School Council and Planning Team must be able to read and understand the essence of this material if they are to contribute competently to the planning of the school facilities.

9.1.2. Business Plan Summary

Below is a summary of some of the issues which might be dealt with in a Business Plan for a school:

Demographic Analysis

Demographics is the study of population trends in a community. Demographic analyses are particularly relevant to schools as they provide vital information as to the school's potential market.

The demographics of the drawing area will have a bearing on the school's promotional program, its staffing program as well as it's anticipated growth potential.

The rate of growth for the school will have a direct bearing on the basic layout and the need for buildings. A school which will achieve maximum enrolment in a short time can build most of its facilities at once - a school which is growing over a period of years can not afford to have facilities lying dormant.

Demographic data may be obtained from State Government Planning Agencies, Local Councils and other agencies such as the Bureau of Statistics.

It is also recommended that schools undertake their own demographic studies to supplement public information. For new schools it is essential to try to estimate market share by holding public meetings, seeking expressions of interest from parents etc..

Enquiry History

In the case of an existing school the enrolment trends to date will be very useful in projecting future growth. Schools which keep accurate records of enrolment applications, the date they are received and the percentage which result in confirmed enrolment will be in the best position to be able to forecast future trends. This is made comparatively simple if data base records are established as part of the enrolment process commencing with the initial application.

Financial Plan

The Financial Plan will be a detailed statement projecting income and expenditure patterns over a period of 5 years or more. It requires a fundamental understanding of school funding, including funding policies of government bodies and agencies. For example school financial planners should be aware of the Commonwealth

Government's current funding formula for recurrent grants - the Education Resources Index (ERI) and the impact on this formula of particular school income and expenditure decisions.

Advice should be sought from State AIS, CEO or Block Grant Authority offices (see Appendix 9.3) with regard to likely trends in Government funding patterns.

The financial plan will also need to address issues such as:

- capital debt repayment policies
- borrowing capacity
- financial controls
- fee levels and discounts, assistance with capital projects through grants, loans and interest subsidies

Promotion

A plan for the promotion of the school will have some relevance to planning for capital projects - the building program itself may well be part of the promotion strategy.

Overall strategy

On the basis of the above an overall strategy can be developed for

- the recruiting of staff and enrolment of students
- a program for the commencement of a school or to increase existing enrolments
- the construction of buildings; note that the rate of growth and type of facility required will vary between primary and secondary schools. The latter are more complex and require more specialist facilities - increasingly so in senior secondary grades.

Contingency plan

A contingency plan to cater for unexpected changes in growth patterns, major changes in education policy etc., is wise. Changes of this nature, particularly in growth phases where borrowings are usually very high can effect the viability of a school.

Such plans help minimise risk and encourage greater lending assistance.

The contingency plan with respect to facilities may include devising alternative uses for buildings, moving buildings off site, subdividing rooms, changing the site itself etc..

9.2. Glossary

Aesthetics	Having to do with an appreciation of beauty, conforming to principles of good taste.
Acoustics	The science by which sound can be analysed and predictions can be made about the performance of materials in reinforcing or reducing sound in and through spaces or materials.
Architect	A person may only be described as an architect if they are appropriately registered as an architect under the provisions of the various State Government laws and regulations.
As-built	Drawings and sometimes photographic records to illustrate the building as it was in fact built. These records are important because changes from the original contract documents are often necessary.
BCA	Building Code of Australia - the current regulations governing building construction.
Berm	An embankment formed to screen from view or to deflect sound and/or water.
Block Grants	Commonwealth Government funds made available to non-government schools for the establishing of capital projects.
BGA	Block Grant Authority - established as an agency of the Commonwealth Government to assess applications for capital funds and to make recommendations to the Commonwealth.
Brief	A structured presentation of the requirements of the client or user of a building project, expressed in both words and numbers as well as diagrams to establish the criteria to be met in the design.
Building Services	Refer to Services
CAD	Computer Aided Drafting or Design
Conduit	A pipe through which cables are drawn and are thus protected. These can be buried in the ground or be exposed on walls but are usually hidden for aesthetic reasons.
Consultants	People with appropriate qualifications to advise on aspects of design and construction, usually with tertiary qualifications and belonging to professional associations.

Contract Documents	The working drawings, specification and contract conditions on which contractors form an opinion as to the cost and which form the basis of a building contract.
DEET	Department of Employment, Education and Training - a Commonwealth Government instrumentality to fund and administer schools.
Demographics	A description of the population trends and age ranges of a particular community along with an attempt to forecast the likely population trends.
Echo	The discernible and discrete repetition of sound within a space.
Exits	In terms of Building Code requirements not all external full height openings (doorways) are required exists. Those that are, need to conform to certain regulations regarding location, size and means of locking and opening.
Footings	The lowest part of the structure on which the rest of the building rests. The footings rest on the foundations.
Foundations	The material in the ground on which the structure is to be built - if not rock then it will more than likely be a stable material such as shale or non-reactive clay.
Globals	A formula used by the Commonwealth Government to assist in determining eligibility for capital grants.
Hardware	Door handles, hinges, door closers, towel rails, cupboard catches and the like.
Hose Reels	Reels to which are fitted small (but larger than a garden hose) diameter hoses and nozzles, installed as part of the fire-fighting installation. They are capable of being used by untrained personnel.
Hydrants	Large diameter pipes either below or above the ground with connections to facilitate connection of fire-hoses, installed as part of the fire-fighting installation either in the street or within large building complexes such as schools. Their location is regulated by building codes and fire-fighting authorities.
Industrial Technology	A collection of skills and knowledge bases taught in schools as part of the preparing of students for the work environment and as part of the process of developing understanding as to the nature of materials and how they may be manipulated and fabricated.
Life-cycle	The term is used generally in relation to assessing the cost of a material or piece of equipment taking into account all costs from preparation and purchase to the point where the item needs to be replaced.

Microwave link	A means by which data can be transferred by means of high frequency electromagnetic signals - sent and received by dish shaped antennae.
Middle School	The group of classes between early primary and late or senior secondary - thus forming three divisions of classes in schools catering for all years of formal schooling.
OECD	Organisation for Economic Co-operation and Development 2rue Andre-Pascal, 75775 Paris Cedex 16, France Refer Appendix 9.7 for further details including local contact.
Quantity Surveyor	A person usually with tertiary qualifications employed and skilled to measure the quantity of materials to be used in a building project and to forecast costs and manage budgets.
Relocatable	Sometimes referred to as demountable or transportable building - a building capable of being moved from one site to another, usually constructed in a factory and brought to the site in a practically finished state.
Reticulation	The system for distributing fluids such as water, gas or energy (power or data/voice) around a site or building.
Reverberation	The continuing of sound after the source of the sound is no longer operating. Like an echo but the sound is not discrete.
Reverse-cycle	A form of air-conditioning which provides both heating and cooling, drawing from or "dumping" heat into the atmosphere to modulate the temperature within the building to acceptable levels.
Rise and Fall	A formula often used in construction contracts to modulate the contract price in relation to changes in wages and/or cost of materials.
Runnel	A channel usually in a science bench top as an alternative to using individual sinks for disposing of waste water and chemicals.
Sanitary drainage	Pipework for the disposal of sewage or waste water - referred to as "sanitary" due to the health requirements for the health-safe transit of such fluids.
Services	The supply and disposal systems of the building. These supply energy for power and light, fresh and cooled or heated air, water, security, and the systems needed to dispose of waste water, foul air or gases.
Sewage	Waste water from kitchens, bathrooms and toilets. Must be treated differently and kept separate from stormwater.

Sewerage	The system of pipes and ancillary equipment for conveying sewage and treating it.
Stormwater	Water falling on or flowing over land and buildings directly or indirectly from rain. Must be treated differently and kept separate from sewage.
TAFE	Technical and Further Education
Tendering	The process of obtaining competitive prices for a project.
Terrain	A tract of land with particular and distinctive features.
Topography	A means of describing the formation of land, changes in level, waterways and the like.
Value Management	A disciplined process of evaluation of a process or design to ensure the best possible value is achieved.
Zoning	A device used by town planners in the local government context to regulate the kind of development which may or may not be permitted in the various areas of the town, municipality or shire.

9.3. Block Grants Authorities

The Commonwealth Government Capital funding program is administered by various Block Grant Authorities (BGA) in the states as agents of the Commonwealth Government. Schools are encouraged to be linked with the relevant group in their state and apply for capital grants through them. The BGA's operate under guidelines established by the Commonwealth. They make recommendations to the Commonwealth as to the school's eligibility and entitlement after analysis based on inquiry and information provided by the school in their application.

Applications are usually called for quite early in each year and recommendations are usually completed by the end of September. The Commonwealth Minister makes the final decision on offers of grants to schools.

Schools considering making application for a capital grant should in the first instance make contact with the relevant BGA in their State as to membership and then for application forms. Documentation required by the BGA is comprehensive and covers both project details and financial matters in order to assess the need of each school in relation to the demand which is often greater than the resources available.

The BGA's are available to provide advice and information as to how the program operates. A number of BGA's offer additional consulting services to schools on a fee for service basis.

Block Grant Authorities

New South Wales

Association of Independent Schools of
NSW Block Grant Authority Ltd
Level 9, Reid House
75 King Street
SYDNEY NSW 2000

Phone	(02) 299 2845
Fax	(02) 290 2274

New South Wales Catholic Block Grant Authority
PO Box A169
SYDNEY SOUTH NSW 2000

Phone	(02) 287 1555
Fax	(02) 264 6308

Victoria

Victorian Independent Schools BGA Limited
20 Garden Street
South Yarra VIC 3141

Phone	(03) 826 6765
Fax	(03) 826 6066

Victoria (continued)

Catholic Capital Grants (Victoria) Ltd
PO Box 146
EAST MELBOURNE VIC 3002

Phone	(03) 665 0333
Fax	(03) 663 4417

Queensland

Independent Schools of Queensland
Block Grant Authority Pty Ltd
AISQ House
122 Fortescue Street
SPRING HILL QLD 4000

Phone	(07) 839 2142
Fax	(07) 839 2158

Queensland Catholic Block Grant Authority
Queensland Catholic Education Commission
GPO Box 2441
BRISBANE QLD 4001

Phone	(07) 224 3333
Fax	(07) 229 0907

Western Australia

AISWA Capital Grant Association
Suite 3, 41 Walters Drive
Herdsman Business Park
OSBORNE PARK WA 6017

Phone	(09) 244 2788
Fax	(09) 244 2786

Catholic Education Commission of WA
Trustees Association Inc (BGA)
PO Box 198
LEEDERVILLE WA 6007

Phone	(09) 388 4388
Fax	(09) 381 3201

South Australia

ISB Block Grant Authority Inc
301 Unley Road
MALVERN SA 5061

Phone	(08) 373 0755
Fax	(08) 373 1116

South Australia (continued)

South Australian Commission for
Catholic Schools Inc (BGA)
Catholic Education Office
GPO Box 179
TORRENSVILLE SA 5031

Phone	(08) 301 6600
Fax	(08) 301 6611

Tasmania

Independent Schools Block Grant Authority of
Tasmania Pty Ltd
PO Box 1845
LAUNCESTON TAS 7250

Phone	(003) 34 1908
Fax	(003) 34 2017

Tasmanian Catholic Block Grant Authority
PO Box 102
HOBART TAS 7002

Phone	(002) 31 1033
Fax	(002) 31 1793

Northern Territory

Northern Territory Block Grant Authority
GPO Box 4519
DARWIN NT 0801

Phone	(089) 84 3833
Fax	(089) 47 1517

Australian Capital Territory

ACT Block Grant Authority
PO Box 1483
WODEN ACT 2606

Phone	(06) 285 1808
Fax	(06) 285 1860

Seminars and literature

A number of the BGA's and/or independent schools associations conduct seminars for those interested in capital development programs, in particular in relation to capital grant applications. Enquire of the relevant association as to if and when such seminars may be operating.

The author is available to contribute to such seminars.

9.4. Site Selection Approval Guide

On this and the following page a process for evaluating sites under consideration for a school is outlined. Firstly in this page a matrix to assess the various aspects of a particular site. On the next page a matrix to assist in making objective comparisons across a range of sites. The next page also contains some factors which will assist in making the evaluation.

This information is used by permission from the

Council of Educational Facility Planners, International
8687 E. Via de Ventura, Suite 311 Scottsdale, AZ 85258-3347

The information is taken from The Educational Facility Planner - School Site Problems and Solutions - Volume 31 Number 6 - 1993 pages 11 and 12. Some changes to the information on the following page have been made to align with terminology used in Australia.

SITE REVIEW ANALYSIS

After the team has considered the criteria the following worksheet should be used to rank each site. The number of points assigned to each factor is based on the experiences of the consultants in the School Facilities Planning Division.

NOTE: A score of zero on a critical factor such as safety, for example, indicates that the negative aspects of the factor could not reasonably be mitigated. Therefore, the site should be eliminated from consideration, regardless of potential high scores on other factors.

Site Identification:
Location:
Gross Acres:
Grade Levels:
Estimated Value:

FACTORS	0	1	2	3	4	5	TOTAL
Safety (20 possible points)	DANGEROUS					SAFE	x4 =
Location (15 possible points)	REMOTE					CONVENIENT	x3 =
Environment (10 possible points)	POLLUTED					CLEAN	x2=
Soils (10 possible points)	UNSUITABLE					SUITABLE	x2 =
Topography (10 possible points)	UNSUITABLE					SUITABLE	x2 =
Size and Shape (10 possible points)	INADEQUATE					ADEQUATE	x2 =
Accessibility (10 possible points)	OBSTRUCTED					ACCESSIBLE	x2 =

	0	1	2	3	TOTAL
Public Services (3 possible points)	UNSERVICED			SERVICED	x1 =
Utilities (3 possible points)	UNAVAILABLE			AVAILABLE	x1 =
Cost (3 possible points)	EXPENSIVE			ECONOMICAL	x1 =
Availability (3 possible points)	EASY			DIFFICULT	x1 =
Political implications (3 possible points)	CONFLICT			HARMONIOUS	x1 =

TOTAL POINTS
(100 Possible)

BEST COPY AVAILABLE

SITE EVALUATION SUMMARY

FACTORS	POSSIBLE POINTS	SITE IDENTIFICATION				
SAFETY	20					
LOCATION	10					
ENVIRONMENT	10					
SOILS	10					
TOPOGRAPHY	10					
SIZE AND SHAPE	10					
ACCESSIBILITY	10					
PUBLIC SERVICES	3					
UTILITIES	3					
COST	3					
AVAILABILITY	3					
POLITICAL IMPLICATIONS	3					
TOTAL POINTS	100					

SITE REVIEW CONSIDERATIONS

Safety (Factors to avoid)

- Adjacent to highways and railway and lacks sound buffer
- Within 3km of an airport runway or heliport
- Close to high voltage power lines
- Contaminants or toxic wastes in the soil or groundwater from landfill, dumps, chemical plants, or agricultural use of pesticides or fertilisers
- Close to open-cut mining
- On or near a fault zone or active fault
- In a flood-prone area of dam or flood plain
- Social hazards in the neighbourhood such as high incidence of crime and drug or alcohol abuse

Location

- Strategically located to avoid extensive transporting and to minimise student travel distance
- Compatible with current and future zoning regulations
- Close to public services, such as libraries, parks and museums
- Favourable orientation to wind and natural

Environment

- Free from sources of noise that may impede the instructional process
- Free from air pollution, smoke, dust, and odours
- Provides aesthetic view from and of the site
- Compatible with the curriculum

Site Review Considerations Continued

Soils

- Proximity to fault lines or fault traces
- Stable subsurface and bearing capacity
- Danger of slides or liquefaction
- Percolation of septic system and drainage
- Adequate water table level
- Existing land fill reasonable compacted. NOTE: A geologic test must be conducted to determine soil conditions

Topography

- Surface and subsurface drainage
- Rock ledges or outcropping
- Feasibility of mitigating steep grades
- Level area for playing fields

Size and Shape

- Net areas consistent with recommendations of School Facilities Planning Division's School Site Analysis and Development Guide (in Australia use DEET Guide - see paragraph 2.1.8)
- Appropriate length to width ratio
- Sufficient open play area and open space
- Potential for expansion for future needs
- Adequate and separate bus loading and parking

Accessibility

- Access and dispersal roads
- Natural obstacles such as grades or gullies
- Obstacles such as crossings on major streets and intersections, narrow/winding streets, heavy traffic patterns
- Freeway access for bus transportation
- Pedestrian traffic patterns

9.5. Value Management Resources

The concept of Value Management is outlined in chapter 1 (1.7).

There are a number of resource personnel and organisations which are available to help schools who may want to conduct a Value Management Study of their project.

Institute of Value Management Australia
Contact Alan Butler - (02) 372 8026 for list of registered members of the Insititute.

National Centre for Value Management (Canberra)
University of Canberra
PO Box 1
BELCONNEN ACT 2616

Contact Professor Roy Barton

Phone	(06) 201 2572
Fax	(06) 201 5034

National Centre for Value Management (NSW)
Level 15 McKell Building,
2-24 Rawson Place
SYDNEY NSW 2000

Contact Alan Butler

Phone	(02) 372 8026
Fax	(02) 372 8033

Page, Kirkland, Tierney
Value Management Consultants
Level 3, 38 Oxley Pl
ST LEONARDS NSW 2065

Contact Declan Tierney

Phone	(02) 906 8334
Fax	(02) 906 8337

While the following is not a resource for Value Management the facilities provided may assist in decision making by means of electronic recording of discussions and collaboration using sophisticated computer software and hardware.

Decision Support Centre
66 Berry St,
NORTH SYDNEY 2060
Contact John Milford or Doug Naylor
Phone (02) 957 6521

9.6. Schools Visited or Forming Part of Study

All Saints Anglican, Merrimac, Qld

Bayswater North Primary, Vic

Belmont Christian Community School, NSW

Beaconhills Christian College, Packenham, Vic

Bega Valley Christian Partent Controlled School, NSW

Billanook College, Mooroolbark, Vic

Caloundra Christian Community School, Caloundra Qld

Cape Byron Rudolph Steiner School, Cape Byron, NSW

Christian College, Highton, Geelong, Vic

Cornerstone College, Mt Barker, SA

Faith Lutheran, Tanunda, SA

Golden Grove Lutheran, Wynn Vale, SA

Good Shepherd Lutheran, Noosa, Qld

Green Point Baptist, Christian Community School, NSW

Heathdale Christian College, Werribee, Vic

Immanuel College, Novar Gardens, SA

Kena Kena Primary School, NZ

Kings Christian College, Mudgeeraba, Qld

Lindisfarne Anglican College, Terranora, NSW

Moreton Bay College, Wynnum, Qld

Morialta High School, SA

Mt District Christian School, Monbulk, Vic

Mt Eliza High School, Vic

Mueller College, Redcliffe, Qld

New Leith Academy, Edinburgh, Scotland

Northside Christian College, Bundoora, Vic

Overnewton College, Keilor, Vic

Pacific Hills Christian School, Dural, NSW

Penrith Christian School, Penrith, NSW

Pilgrim School, Aberfoyle Park, SA

Plenty Valley Christian School, Plenty Valley, Vic

Portside Christian School, Ethelton, SA

Redlands Christian College, Redlands, Qld

Roseville College, Roseville, NSW

Samford Valley Steiner, White Mountain, Qld

St Marys Christian School, St Marys, NSW

Temple College, Mile End, SA

Trinity College, Gawler, SA

Tuggeranong College, ACT

Waldorf School, Mt Barker, SA

Woori Yallock Primary School, Vic

Yarra Valley Anglican School, Vic

9.7. References

Literature in relation to school buildings is fairly prolific, but not always readily available. This Guide Document aims to be a source document or digest and directory as well as provide an overview of a planning process to achieve a successful school building project.

This Appendix lists most if not all of the documents referred to in the main text as well as other material that Master Planning Teams may find useful.

Schools Commission

In the early days of the Schools Commission some very useful documents were produced. Some of these are still being used. The very positive response to a new and updated resource document has been a clear indication of the need for such a study.

Some of the topics covered in Schools Commission documents are:

- Guidelines for General School Buildings September 1975
- Planning and Managing a School Building Projects December 1976 ISBN 0 6440 1871 2
- Cost Planning - Preparing a Budget December 1976
- Books and Beyond (Second Edition) – 1979
- Schools Design and Use – 1982 Australian Government Publishing Service
- Science Learning Areas in Australian Schools – 1982
- School and Community Facilities - how to make the best use of available resources – 1981
- Comparative Suitability of materials and finishes for schools in Australia - 1982 ISBN 0 644 02228 0

DEET Literature

Each year the Commonwealth Department of Employment, Education and Training publish a book under the title Commonwealth Programs for Schools - Administrative Guidelines. It contains important information regarding recurrent and capital funding programs and is essential information for key people in the Master Planning Team, in particular the Financial Sub-group.

Catholic Education Commissions

The Catholic Schools peak body in Queensland, Queensland Catholic Education Commission has provided excellent leadership in holding a seminar in 1991 drawing together expertise from various parts of Australia. It is referred to as the "Proceedings of the Conference on the Capital Needs of Catholic Schools".

The seminar summary would be a useful tool for all schools and a valuable supplement to this Guide Document.

OECD Literature

The Organisation for Economic Co-operation and Development operates a program referred to as PEB/Programme on Educational Building. Regular seminars are held in various parts of the world and each focuses on a specific issue. These seminars are summarised in booklets available through the distributors:

Bookshop - 33 rue Octave-Feuillet 75016 Paris

Australia - DA Information Services 648 Whitehorse Road
POB 163 Mitcham, Victoria 3132
Phone (03) 9873 4411 Fax (03) 9873 5679

DA Information Services carry stocks of all current material and get other published material in 4-6 weeks.

Topics such as the following have been published and may be still available. If not try local Schools Association offices.

- The will to manage energy in Schools - Vienna May 1984
- Maintenance of Educational Buildings Policies and Strategies - Belgium October 1985
- Building implication of New Information Technology Dumblane Scotland - Sept 1985
- Application of Economic Appraisal to Educational Building - October 1986
- Educational Space Requirements and the Effective Use of Resources - Lysebu, Norway May 1986
- Greater Institutional Responsibility for Educational Property Management - Cambridge September 1986
- Schools as part of a Network of Learning Facilities Implications for Educational Buildings - Segovia, Spain December 1986
- Safety and Security in Educational buildings - Semmering, Austria May 1987
- Time for Change - Organisation of School time and implications for Building - October 1987
- Adaptability and Flexibility in Educational Facilities - Leicester June 1989
- New Technology and its impact on Educational Buildings - LETA Conference Adelaide Australia 1994
- Redefining the Place to Learn - A Study of Technology and the Design of the Learning Environment by Susan Stuebing 1994

OECD conduct a parallel program referred to as Program on Educational Building - Long Term Perspectives. Publications in that series to hand are:

- Information Technology by Hirokuni Taniguchi - 1987
- Individual Learning Harvard College, Prince Edward Island - 1987
- Golden Grove a Secondary Education Complex in South Australia - 1989
- Year Round Schools An example from the United States - 1986

- Information Technology
  Its impact on Japanese School Design - 1987
- The Alford Information Technology Centre - 1989

As part of the PEB program a newsletter type publication is issued called PEB Exchange. These cover a range of topics in each issue with the intent of exchanging information and experience on current research, projects and developments in the field of educational building. Countries participating include Australia, United Kingdom and a number of European countries.

Architectural magazines

Not readily available to the public but available if sought out are magazines such as

- Architecture in Australia
- Overseas magazines such as Aujourd Hui, Architectural Record, Architectural Forum and the like which from time to time feature educational buildings.

Architecture in Australia is the official journal of the Royal Australian Institute of Architects. Subscriptions are available through;

Architecture Media Australia Pty Ltd
4 Princes St, Port Melbourne Vic 3207
Phone (03) 9646 4760 Fax (03) 9646 4918

State Government Department Guideline Documents

The Department of School Education and Department of Public Works in New South Wales have produced jointly a series of Guides for Primary and Secondary School planning. These are designed for use by architects consulting in the design of government schools. They give comprehensive and detail plans for most if not all school spaces.

Likewise relevant government departments have done similar work in other states with varying levels of availability.

In the first instance check with the local BGA to determine if any such material is available for reference. Then check to determine if there are any limitations on the use of this information in the design of non-government schools.

Spaces for Learning - An Educational Specification for Primary Schools in NSW - 1979

This is a non-technical general guide. It does not provide quantitative information.

Curriculum Requirements

The Board of Studies of NSW has published a number of booklets outlining curriculum requirements for education programs Kindergarten to Year 12. The latest version of these documents will be an essential component of the documentation on which the Master Planning Team will need to operate, in particular the Educational sub-group.

These documents will provide a guide as to the subject matter and therefore the environment required in the school.

NSW Government interest Subsidy

Schools in NSW are eligible to apply for subsidy on the interest component of the cost of capital projects.

In order to be eligible space allocation must comply with the guideline areas unless some drop in level of subsidy is expected. These guideline areas are published in a booklet available from the

Director of Finance
Department of School Education
6th floor, Signature Tower
2-10 Wentworth Street
Parramatta NSW 2150

Council of Educational Facility Planners, International

This organisation is based in Arizona, USA and has produced a number of documents which would be useful to Master Planning Teams.

- The Guide for Planning Educational Facilities
- The Computer Facilities Guide
- The Guide for School Facility Appraisal
- Educational Facility Planner (Annual Subscription)
- CEFPI Consultants Directory
- CEFPI 1993 Design Portfolio

The above documents area available from:

Council of Educational Facility Planners International
8687 E Via de Ventura, Suite 311
Scottsdale, Az 85258-3347
phone International area code + (602) 948 2337
fax International area code + (602) 948 4420

Books

School Ways – The planning and Design of American Schools
Ben E Graves
An Architectural Record/McGraw-Hill Professional Group Book
Edited by Clifford A Pearson
ISBN 0 07 002468 5
Published 1993

Technical Literature

EBS Bulletin 8 - Sunshine and Shade in Australasia
R O Phillips B Arch ARAIA
Australian Government Publishing Service Canberra 1983
Fourth Edition

This is a useful document in determining the direction and angle of the sun's rays at any time, any location throughout Australia, New Zealand, New Guinea and adjacent islands

Energy information

Solar Energy and Building by S V Szokolay

Published by Edward Arnold (Aust) Pty Ltd, Melbourne
1979 ISBN 0 7267 1008 3
This is a technical document but with many sketches illustrating ways to minimise energy use and maximise the use of solar energy.

Building Energy Manual

Produced by State Projects - the professional services arm of the NSW Public Works, for the Office of Energy.
Published 1993
ISBN 0 7310 0909 6

The Energy Guide

This is principally designed for use by householders but contains much useful information applying to the use of energy in schools, in particular as to how to conserve energy use.

Australian Government and Australian Consumers' Association
ISBN 0 644 12565 5

Victorian Independent Schools BGA Limited - Documents

The VIS BGA have produced a number of monographs on a variety of subjects related to capital projects and are available on application.

- Report on School Library Facilities with particular reference to the Victorian Certificate of Education - Irene Terry, June 1992
- A Model for the Assessment of School Computer Needs - Des Parker, August 1993
- A Survey of the Use of Technology in Schools - Des Parker, October 1993
- Research Paper on a Model for a Curriculum Centre for St Margaret's School - May 1994
- Research Project Report - Evaluation of Projects funded under the QC&TS Element of the Capital Grants Program 1993 - Lionel Parrott, September 1994
- Design and Technology - A Centre of Excellence - Report on St Michael's Grammar School by D & H Marsden, 1994

VIS BGA also publish regularly a Facilities Update Letter - Numbers 1 to 4 inclusive Nov 1991 to September 1993 are available.

ICAC Independent Commission against Corruption - Monograph on Tendering and Purchasing called

Pitfalls and Probity - Case Studies. ISBN 0 7310 0241 5
published June 1993

NSW Government Public Works Department

For comprehensive help in **asset management** schools will find much help in the **Total Asset Management Manual** published by the New South Wales, Public Works Department, Policy Division.

The manual contains articles on Economic Appraisal, Value Management, Post Completion Reviews, Capitalisation Guidelines, Risk Management, Life Cycle Costing, Asset Register Guidelines and Energy Management.

There is a companion manual equally informative referred to as the **Capital Project Procurement Manual**. This manual deals with Codes of Practice, Tendering in relation to construction projects, Various aspects of the culture relating to the construction industry such as quality assurance, Relationship management such as Contracting, Planning in particular relating to the construction program and Management of the construction consultants.

These Manuals can be obtained through the NSW Public Works Department, Asset Management Policy Unit, McKell Building, Rawson Place, Sydney. Phone (02) 372 8877.

9.8.Government Capital Funding Schemes

Commonwealth Government Capital Grants Program

The Commonwealth Government operates a capital grants program which makes funds available through the various Block Grants Authorities (see list in Appendix 9.3) funds for capital projects.

When applying for capital grants certain limits apply governing eligibility, these are referred to as "globals" or global area guidelines. This is a measure of area in relation to pupils enrolled. For every Primary student there is an allowance of 6.13 sq m and for Secondary students 9.75 sq m.

As grants are applied for in advance the forecast enrolment is used to determine the global area entitlement.

Refer section 3.1.3 for more detail.

Room Count considerations

Each Block Grant Authority will have its own guidelines and schools should determine what these are prior to seeking a grant.

The AIS Block Grant Authority in NSW applies a room count check as follows:

- Each primary class will be eligible for a classroom.
- In Secondary schools the following formula is used to determine the number of rooms.
  - ✓ Number of English classes multiplied by a factor of 1.4.
  - ✓ This gives the number of secondary class rooms the school is entitled to.

Adapt to changing needs

There is scope for making concessions in relation to the above guidelines for particular situations, particular;y where schools are in a growth phase.

A school requiring seminar/discussion spaces could have more classroom spaces than the formula suggests, while still keeping within the globals guidelines.

Design for growth

It is not always appropriate to construct all facilities at once, particularly where funds are limited. Indeed funding formulae for Commonwealth Grants programs limit the amount of building that can be provided under the program.

The formula relates numbers of children to total building area as a maximum for that particular stage of growth.

Global guidelines

NSW State Government Refer Appendix 9.9 where NSW Interest Subsidy Scheme is outlined

9.9. State Government Assistance Schemes

New South Wales

The NSW Government provides financial support for schools who borrow money to construct school buildings provided those buildings conform to space allocation guidelines consistent with space provision for state schools. This support is available through the NSW Government Interest Subsidy Scheme. The guidelines as to space allocation as well as the financial constraints are documented in a booklet available to schools from the Director of Finance of the Department of School Education, 2-10 Wentworth St, Parramatta 2150. Projects not requiring this subsidy can ignore these guidelines but as the support is substantial this is not recommended. Although the school may not wish to pursue this resource at present the option should not be ruled out for later stages. For this reason the NSW State Government Interest Subsidy guidelines on area are relevant for NSW schools.

This scheme has another constraint on eligibility - the number of loans and the size of loans which a school can take within a defined period and still attract subsidy. The scheme should be carefully studied before settling on final plans if the maximum benefit is be achieved for the school.

State Government Support in other states

Victoria

The Victorian government makes available each year approximately $1m which is administered through the Catholic and Independent Schools BGA's.

Applications for subsidy is made each year. The guidelines include:

- subsidised loans not to exceed 10 years duration
- maximum subsidised loans is $400,000
- maximum of two years subsidy with maximum subsidy of $5,000 each year
- no interest subsidy in case of Commonwealth Capital Grants

Queensland

The Queensland Government assistance is by way the State Capital Assistance Scheme - a capital grants program which replaced an Interest Subsidy scheme which operated up to 1991.

The funds are allocated on the basis of educational and financial needs by the Queensland BGA's.

South Australia

The State Government has provided support for the non-government school sector by way of joint developments with the Government sector and private developers in such ventures as the Aberfoyle Park and Golden Grove ventures. No other state assistance scheme exists apart from access to loans from state funds for boarding facilities in remote areas. The government is considering a program for assistance to schools in developing areas but this has not yet commenced.

Western Australia

The State Government provides funds through the Low Interest Loan Scheme (LILS) to assist non-government schools to provide facilities as a similar level and standard to those provided in government schools. There are limits on the size of loans to which the scheme applies and these limits vary according to the level of education offered (grades) and whether the school is new or existing.

The applications must be made and approved before entering into a commitment in respect of the project.

Applications are made to the WA Office of Non-Government Education prior to 28 February of the year prior to the financial year in which the loan funds are required by the school. In the case of certain school systems, applications are made through the relevant system office.

Tasmania

Tasmania has a Loan Interest Subsidy Scheme. Eligible loans are those taken out for eligible capital expenditure relating to

- acquisition of land
- erection, alteration and extension of buildings
- installation of essential services

Interest only loans are not eligible.

Applications are to be lodged with the Department of Education and the Arts by early December and annual renewals are to be submitted each April. Further details from Finance, Facilities and Planning Services of the Department of Education and the Arts.

9.10. Cape Byron Steiner School Sewerage Treatment System

When a site for a school is ideal except that there is no access to town sewer the problem may be overcome by installing an on-site sewage treatment facility as was done at the Cape Byron Rudolph Steiner School, Ewingsdale on the north NSW coast.

The system comprises the following elements

- gravity drainage from amenities to primary treatment in septic tanks
- gravity drainage to one of five sealed Stage 1 transpiration beds (fluid is directed to one other by manually operated distribution box - different one each day) as secondary treatment.
- gravity drainage to a series of five sealed Stage 2 transpiration beds. The transpiration beds are described below.
- overflow from these to a polishing bed planted with papyrus, canna and typha. This is more or less an experimental section to try out other plants which might thrive in a high nutrient situation.
- overflow to retention pond (bottom sealed to protect ground water)
- by irrigation pump either to irrigation system or the flow-form structure which provides additional aeration and water then flows back into the transpiration beds and through the whole cycle again.

Transpiration Beds

These are "boxes" with concrete sides and sealed bases over which is laid a series of layers of gravel, aggregate of various sizes, metal dust and sand. Into the sand is planted a special kind of plant which uses a large amount of water and is capable of thriving in the effluent. This plant is called "Phragmytes Australis" - a native reed found in tidal swamps, which has a great appetite for high nutrient compounds.

Use of output for Irrigation

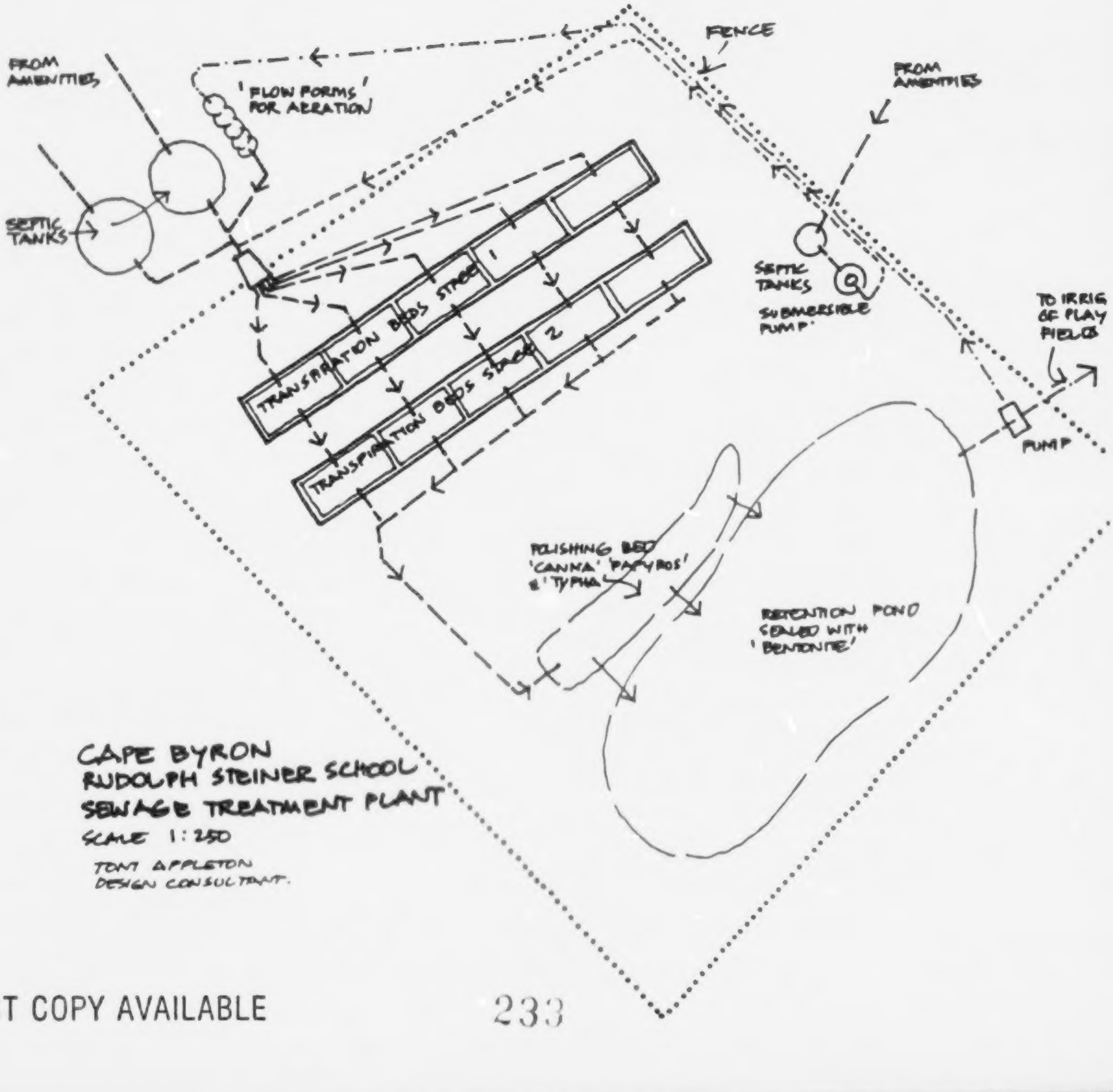
The use of such treatment of water to be used for irrigation is subject to approval of the Environmental Protection Agency.

Schools planing to use such a system will need to have detailed discussions with the local authorities and should anticipate stringent controls and monitoring, specially in the early phases of its use. Check before purchasing the site.

Safety and Security

The system must be fenced of from play areas to be used by school children and the community generally.

Berms (mounds) need to be established to ensure there can be no escape of untreated sewage into community use areas.


FROM AMENITIES
SEPTIC TANKS
'FLOW FORMS' FOR AERATION
FENCE
FROM AMENITIES
TRANSPIRATION BEDS STAGE 1
TRANSPIRATION BEDS STAGE 2
SEPTIC TANKS
SUBMERSIBLE PUMP
TO IRRIG OF PLAY FIELDS
PUMP
POLISHING BED 'CANNA' 'PAPYRUS' & 'TYPHA'
RETENTION POND SEALED WITH 'BENTONITE'

CAPE BYRON
RUDOLPH STEINER SCHOOL
SEWAGE TREATMENT PLANT
SCALE 1:250
TONY APPLETON
DESIGN CONSULTANT.

9.11.Anti Graffiti Method

For a variety of reasons schools are the target of graffiti - that is defacing a buildings interior or exterior, usually the latter, with spray paint, crayon, lipstick, posters or paint.

The most common is spray painted symbols based on a code name identifying the person applying the graffiti known to the local "crowd". The object is to be "seen" by as wide a group as possible.

The defence against graffiti involves one or more of the following strategies:

- locating vulnerable surfaces - those exposed to the public - away from immediate accessibility. This can be done by establishing shrubbery or other barriers immediately in front of these vulnerable surfaces
- treating the surface so that spray paint will not adhere or will be easily washed off
- placing the area under surveillance cameras
- creating a surface which is not easily painted or to which posters can not easily be adhered to - e.g. a heavily textured surface
- regular maintenance - experience shows that when signs are immediately dealt with the attractiveness to graffiti artists is significantly diminished

Wall treatments

A number of treatments are available for reducing the adhesion characteristics of walls such that graffiti can be more easily removed:

1 Choice Anti-graffiti - a treatment employing vegetable wax extracts which leaves the surface apparently untreated - no glossy lacquered appearance according to the manufacturer - Choice Chemical Distributors Pty Ltd

2 Wall-Tech AG suitable for both concrete, brickwork, masonry or stone.

3 Neoferma anti-graffiti sealer - WB manufacturer can be contacted at Suite 15, 32 Campbell Av Dee Why 2099.

9.12.Project Management Guidelines

The AIS BGA Limited have published "Project and Construction Management Guidelines" a copy of the current version follows:

AIS NSW BGA Limited

PROJECT AND CONSTRUCTION MANAGEMENT GUIDELINES

Project Management:

Project Management in this document is to be understood to mean the process of managing a building project through all of its stages ie. from the initial request of a school for a building to the final completion of all accounts including, on the way through, the appointment of consultants, preparation of budgets and sometimes even arranging the finances. In most cases the school governing body undertakes this work.

Part of this process involves the actual construction work. This may be done in a variety of ways. Sometimes by calling tenders and entering into a contract with one of the tenderers, often referred to as a "Lump Sum Contract" which may include provision for cost increases. Another method is sometimes call Project Management. In this document it will be called **Construction Management** for reasons which will become clear.

The way a "Lump Sum Contract" operates is as follows. The school community agrees to pay an agreed sum for a building described in a set of contract documents. Once the contract is signed the builder then proceeds with managing the construction and the savings he can make sometimes offset any unexpected additional costs and provided the contract does not allow him to charge for those additional costs then he gains or loses depending upon the accuracy of his initial estimate.

It can be argued, in some circumstances where a school governing body has available to it the required expertise that Construction Management is a viable option with resultant benefits to that school. These benefits should be capable of being clearly defined.

Construction Management should only be considered if the school has such expertise and personnel already within its organisation or is able to supplement already existing skills with readily available consultants who will be available over the likely period of the project.

If the school governing body does not already have some expertise in these matters the traditional method of calling for tenders with its well known safeguards is to be preferred. One real danger of Construction Management is that if adequate skills are not available to properly contract and control a project, costs can escalate and the whole project (and possibly the school) is therefore placed in jeopardy.

Construction Management may provide more control on end cost and may also shorten construction time, however this can only be assured if effective means are used to monitor the project on a regular basis and this may mean week by week.

Another advantage of Construction Management is that design changes which often do occur can be made without penalty. Experience shows that such changes in the context of a lump sum contract often result in additional costs to the proprietor or schools. Construction Management can sometimes can avoid these costs or at least allow the flexibility to offset them. This does not mean that a school should assume it can take short cuts in the planning process.

A successful project using Construction Management depends on the ability of the Construction Manager to estimate final prices accurately and to keep tight control on costs as the project proceeds. The estimate needs to take into account the tendering climate in the district, and the monitoring needs to be done methodically and regularly.

The AIS NSW BGA is prepared to consider requests from Schools for Construction management provided the following conditions are met:

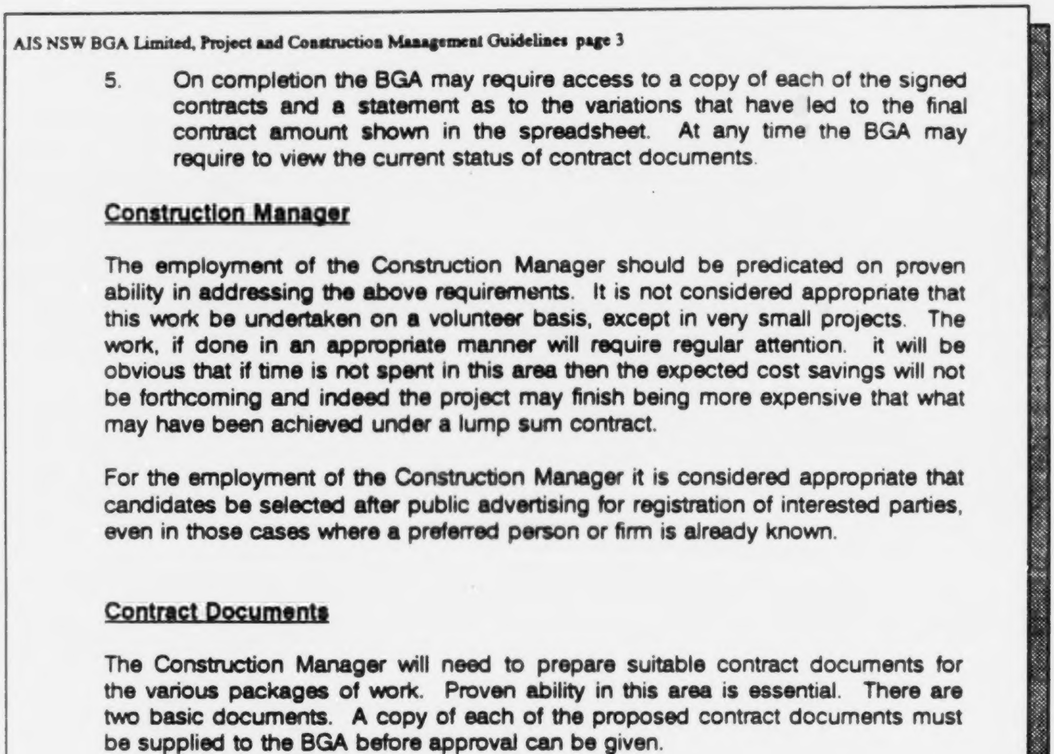
1. A detailed costing of the project is to be prepared and approved by AIS NSW BGA Limited. Each proposed package or contract is to be costed. This will generally mean more than each trade being costed. For example a project costing around $1m may be broken up into 50 or 60 elements or packages.

   For example the trade called "Concrete" should be broken up into packages such as Formwork, Ground Treatment, Reinforcement Supply, Reinforcement Fixing, Concrete Supply, Concrete Placing and Curing. Furthermore the individual "packages" will need careful definition to ensure that there are no gaps. For example "formwork" will have to be defined to include removal and stripping and co-operation with trades for penetrations and the like.

2. The administrative aspects of the contractual process need also to be carefully analyzed and allowed for eg: insurances, Council and approval of other authorities. These costs need to be provided for in the overall costing by the school.

3. Suitable software be obtained for regular review of the variations, additional work, contract price against budget, inflation (if any contracts are let with an inflation clause), payments made and balance to be paid, all compared package by package to the original budget. This can be based on most simple spreadsheets. A copy of the proposed spreadsheet is to be provided before approval of Construction Management can be recommended. An example of an acceptable spreadsheet is attached.

4. Regular monthly reports including a copy of the updated spreadsheet is to be given to the school governing body and made available on request to the BGA. No work is to commence until the budget is agreed by the BGA. A copy of the spreadsheet with any explanations will be required.



5. On completion the BGA may require access to a copy of each of the signed contracts and a statement as to the variations that have led to the final contract amount shown in the spreadsheet. At any time the BGA may require to view the current status of contract documents.

Construction Manager

The employment of the Construction Manager should be predicated on proven ability in addressing the above requirements. It is not considered appropriate that this work be undertaken on a volunteer basis, except in very small projects. The work, if done in an appropriate manner will require regular attention. it will be obvious that if time is not spent in this area then the expected cost savings will not be forthcoming and indeed the project may finish being more expensive that what may have been achieved under a lump sum contract.

For the employment of the Construction Manager it is considered appropriate that candidates be selected after public advertising for registration of interested parties, even in those cases where a preferred person or firm is already known.

Contract Documents

The Construction Manager will need to prepare suitable contract documents for the various packages of work. Proven ability in this area is essential. There are two basic documents. A copy of each of the proposed contract documents must be supplied to the BGA before approval can be given.

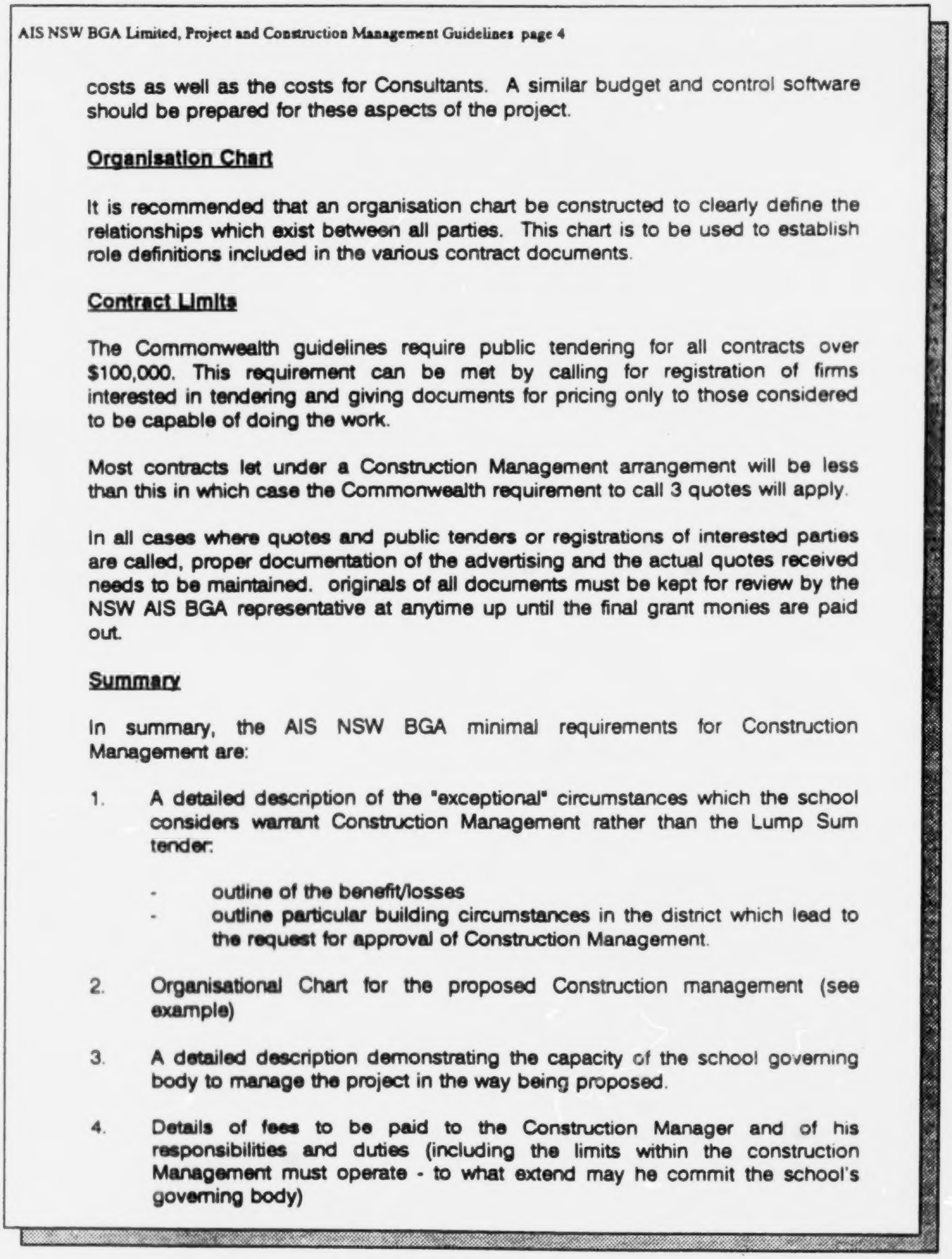
The first of these will set out the responsibilities of the various suppliers and trades and describe in detail the extent of the work. In addition the relationship to the various contractors and the client and the role of the Construction Manager in these will need to be defined in another contract document.

The second will set out the relationship between the Construction Manager and the school governing body. His fees, responsibility for cost control, the degree to which he can commit the school are all aspects that will need to be dealt with in such a document.

It is sometimes a characteristic of such arrangements that the Construction Manager will be entering into contracts on behalf of the client. If this is the case then the client will want to be very sure that there are effective limits on what the Construction Manager can commit the client to. On the other hand it may be that the Construction manager only recommends and the client enters into contracts directly with the various contractors.

Project Manager

The AIS NSW BGA will be regarding the School/Approved Authority as the Project Manager responsible for the costs of the whole project including the construction



costs as well as the costs for Consultants. A similar budget and control software should be prepared for these aspects of the project.

Organisation Chart

It is recommended that an organisation chart be constructed to clearly define the relationships which exist between all parties. This chart is to be used to establish role definitions included in the various contract documents.

Contract Limits

The Commonwealth guidelines require public tendering for all contracts over $100,000. This requirement can be met by calling for registration of firms interested in tendering and giving documents for pricing only to those considered to be capable of doing the work.

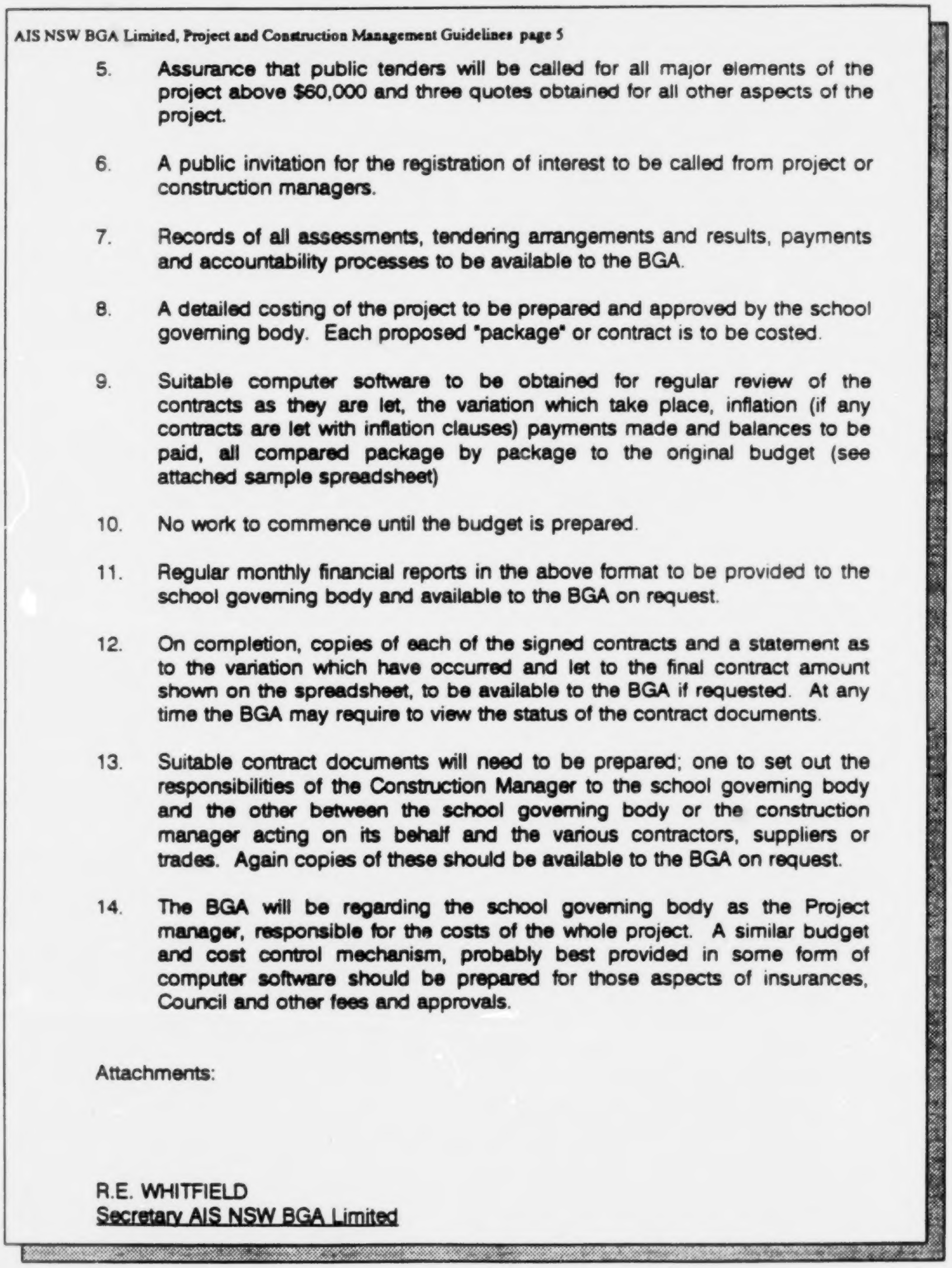
Most contracts let under a Construction Management arrangement will be less than this in which case the Commonwealth requirement to call 3 quotes will apply.

In all cases where quotes and public tenders or registrations of interested parties are called, proper documentation of the advertising and the actual quotes received needs to be maintained. originals of all documents must be kept for review by the NSW AIS BGA representative at anytime up until the final grant monies are paid out.

Summary

In summary, the AIS NSW BGA minimal requirements for Construction Management are:

1. A detailed description of the "exceptional" circumstances which the school considers warrant Construction Management rather than the Lump Sum tender:
    - outline of the benefit/losses
    - outline particular building circumstances in the district which lead to the request for approval of Construction Management.
2. Organisational Chart for the proposed Construction management (see example)
3. A detailed description demonstrating the capacity of the school governing body to manage the project in the way being proposed.
4. Details of fees to be paid to the Construction Manager and of his responsibilities and duties (including the limits within the construction Management must operate - to what extend may he commit the school's governing body)



5. Assurance that public tenders will be called for all major elements of the project above $60,000 and three quotes obtained for all other aspects of the project.

6. A public invitation for the registration of interest to be called from project or construction managers.

7. Records of all assessments, tendering arrangements and results, payments and accountability processes to be available to the BGA.

8. A detailed costing of the project to be prepared and approved by the school governing body. Each proposed "package" or contract is to be costed.

9. Suitable computer software to be obtained for regular review of the contracts as they are let, the variation which take place, inflation (if any contracts are let with inflation clauses) payments made and balances to be paid, all compared package by package to the original budget (see attached sample spreadsheet)

10. No work to commence until the budget is prepared.

11. Regular monthly financial reports in the above format to be provided to the school governing body and available to the BGA on request.

12. On completion, copies of each of the signed contracts and a statement as to the variation which have occurred and let to the final contract amount shown on the spreadsheet, to be available to the BGA if requested. At any time the BGA may require to view the status of the contract documents.

13. Suitable contract documents will need to be prepared; one to set out the responsibilities of the Construction Manager to the school governing body and the other between the school governing body or the construction manager acting on its behalf and the various contractors, suppliers or trades. Again copies of these should be available to the BGA on request.

14. The BGA will be regarding the school governing body as the Project manager, responsible for the costs of the whole project. A similar budget and cost control mechanism, probably best provided in some form of computer software should be prepared for those aspects of insurances, Council and other fees and approvals.

Attachments:

R.E. WHITFIELD
Secretary AIS NSW BGA Limited

9.13.Typical Contract Documents

Any significant building project requires careful assembly of the agreement between the builder and the client. Standard contract forms are available prepared by the Standards Association of Australia, The Royal Australian Institute of Architects and Master Builders Australia. These documents have varying emphasis and application and advice should be sought as to which document best applies.

Standard contract forms provide for the following situations:

- where the school engaging a project manager
- where there is no architect to administer the contract
- where there is an architect engaged to administer the contract
- where there are bills of quantities
- a lump sum contract
- a lump sum contract with provision for rise and fall in prices
- a cost plus contract - where rates might be agreed for the work to be done but the amount of work has yet to be established (suitable for alterations work)
- where the contractor is engaged to both design and construct

Some of the contracts in general use available from the Royal Australian Institute of Architects are:

JCC SERIES OF CONTRACTS produced by the Joint Contracts Committee of the Royal Australian Institute of Architects, Master Builders Australia , Incorporated and the Building Owners and Managers Association of Australia. The contracts are:

✓ JCC-C Projects with Bills of Quantities and without Staged Practical Completion

✓ JCC-D Projects without Bills of Quantities and without Staged Practical Completion

✓ JCC-E Projects with Bills of Quantities and with Staged Practical Completion

✓ JCC-F Projects without Bills of Quantities and with Staged Practical Completion

An important feature of these contracts is the provision for "risk-sharing" between proprietor (school) and builder.

SBW2 LUMP SUM CONTRACT

This form of contract is intended for new building works and alterations of a simple nature where the owner (school) has appointed an architect and where bills of quantities have not been prepared.

ABP-1 ADMINISTRATION BY PROPRIETOR CONTRACT

This is a lump sum contract intended for building works of a relatively small scale between a proprietor (school) and a builder where an architect may have prepared the contract documents but is not providing contract administration services.

Some of the contracts in general use available from the Master Builders Association of NSW and probably similar organisations in other states are:

E5B LUMP SUM CONTRACT devised by MBAUST and RAIA contains important provisions regarding instructions by the architect to the builder and sets out their respective rights and responsibilities. This is suitable for use whether or not there are bills of quantities.

AS2124 GENERAL CONDITIONS OF CONTRACT a contract format devised by the Standards Association of Australia for major building works where a superintendent will administer the contract with/without bills of quantities.

There are many other forms of contract available and some of those available from the RAIA are also available from the MBA and vice versa.

9.14.Check List

DBM (south Australian Department for Building Management) is a South Australian Government instrumentality responsible for arranging the design and construction of buildings for government agencies.

They have, as part of their role produced a very comprehensive design check list referred to as a "School Planning and Building Information Checklist". It is a guide to planners and designers of Government Schools in South Australia, and has been developed in conjunction with the South Australian Department for Education and Children's Services, to meet their requirements..

An abbreviated check list, and modified to be more generally applicable to the wider readership based on the DBM document follows:

SCHOOL PLANNING AND BUILDING INFORMATION CHECKLIST

This document is a checklist which Master Planning Teams can use in the collection of data and preparation of design briefs for school projects. It is derived from and based on a document with a similar heading produced by DBM in Adelaide, with permission.

Air Conditioning	Generally all teaching spaces and offices are to have minimum heating and cooling to provide relief from extremes of temperature in accordance with Government policy. See also **Heating Cooling and Ventilation**
Acoustics	Ensure good sound insulation between classrooms, taking care to insulate over walls through ceiling spaces. Use acoustic ceilings where there are hard floor surfaces such as vinyl and are otherwise noisy.
Bag Storage	Under cover near entries but not obstructing clear access.
- Primary	Associated with general learning areas to accommodate bags for 80% enrolment.
- Secondary	In areas where students can access them at class break times without impeding access - allow for 100% enrolment.

Bench heights

Primary	Student bench height 720mm. Consider some at 850mm for staff use
Secondary	Student bench for seated use 720mm, for standing use 850mm
Staff areas	as for Secondary
Wheel chair users	720mm - allow for clear knee-space under

Blackout — **See Curtains, Blinds and Blackout Provision**

Blinds — **See Curtains, Blinds and Blackout Provision**

Bicycle Parks

Visual supervision from teaching area desirable

For Primary schools	15% of enrolment
For Secondary schools	10% of enrolment

Galvanised steel posts concreted into ground

(These percentages may be reduced as bicycle use is decreasing generally.)

Canteen

Provision to include counter and servery hatches, double bowl sink and drainer, hand basin, exhaust fan, telephone point and adequate power points (may require 3 phase power for heating/cooking)

Walls plastered and painted with gloss enamel

Floors - sheet vinyl with welded joints - some authorities may require welded coving under benches.

Flyscreens to opening - windows

Security grilles on doors and windows.

Security alarm system inside

Servery hatches to have heavy duty industrial roller doors with additional locks

Consider a grille on outside as well

Allow for delivery truck access.

Car parking

Allow one car-park for each staff member plus 5 visitor spaces minimum - (local authorities may have other formulae).

Include security and area lighting.

Allow at least one space for wheel chair users (wider than others - 1.5 standard spaces)

Consider need for student parking and including adult re-entry

Clocks

Wall mounting to be provided by contractor with flush electrical outlet unless battery clocks are to be provided.

Electrically operated clocks to be provided in dark rooms.

Coat Storage

Coat hooks to be provided in corridors near learning areas - under pelmets to protect students from eye injury - at a height to suit the students ages.

Compactus Units

Allow for one adjacent to staff areas for text book storage - take account of heavy loading in structural design.

Computer rooms

Adequate power outlets (preferably uninterrupted power supply - if not at least a circuit protected from electrical surges and spikes) with wall ducting 1000mm above floor in specialist computer rooms.

Ceiling and floor power ducts can be considered - avoid power cords across floors.

Lighting, window treatment and ergonomics to Australian Standard for use of Screen Based Equipment

Security grilles on windows and security locks on doors.

Consider special design of benches and tables to suit computers and learning methods.

Cooling

Refer to **Heating Cooling and Ventilation**

Curtains, Blinds and Blackout Provisions

Curtains or blinds are not normally provided as part of any building contract except as follows:

Blackout provisions are required in Secondary schools as follows:

Photography	no windows to dark room
Drama	either no windows or blackout curtains (allow for ventilation

Dim out provisions required as follows:

Primary schools	Drama/multi purpose rooms
Secondary schools	Physics Laboratory
	Social Sciences/Humanities Room
	Environmental Design room

Data Cables

Consider need for data ccommunication around school. Provide conduits between buildings, and in wall and ceiling cavities to teaching areas.

Disabled Persons	Make provision in new schools and major upgrading to accommodate physically disabled persons including wheel chair users including the following ramps and paving to allow at-grade access to entrance doorways and between buildings – minimum 1in 14 adequate width doorways (840 minimum clear opening) wheelchair toilets – refer Australian Standard appropriate height benches in specialist spaces lift to upper floors or ramps using natural landscape as far as possible dedicated car-spaces lever handles to doors and taps lever arms to taps and mixer valves for hot water Refer to Australian Standards
Door Hinges	External doors to have fixed pin hinges and preferably security hinges such as Lanes Security Butt hinges or Chubb Security hinge bolts Pivot hinges not generally recommended.
Door mats	Removable washable mats can be fitted inside all external doors on vinyl or inset in carpet. Metal foot scrapers should be provided where soil likely to be carried on shoes.
Door stops	Provide to all internal doors where necessary to prevent damage to walls or joinery. Consider solid metal types with rubber buffers, fixed to floor.
Doors	External doors not protected by verandahs or wide overhangs should be metal clad for weather protection. All external doors should be solid core and weather resisting. All glazing in doors must be laminated safety glass. - Consider use of material such as Lexan to minimise breakage in high resk areas. Kick plates should be provided on doors in heavy traffic areas. Air-relief grilles must be substantial and fixed so as not to compromise security. External doors should have door closers, pull handles and deadlocks (not lever furniture), and door seals for weather protection. Roller doors to have additional hasp and staple security protection. Sliding doors are not favoured as external doors. Door closers to main external doors should have hold open function. Door handles to be return lever handles - heavy duty quality

Drinking Fountains	One drinking fountain per 30 pupils up to 150 and one per 50 thereafter - check local authorities	
Dust Extraction	Technical studies workshop in Secondary Schools should have dust extraction to requirements of industry authority	
Electric Lighting	**Refer to Lighting**	
Electrical Installations	**Residual Current Devices to be installed in switchboards to Art, Technical Studies, Computing and Science areas in Secondary Schools and in Ground staff workshop and stores. (Generally to circuits where students use electrical equipment)**	
Fire Extinguishers	**Refer Fire Fighting Provisions**	
Fire Fighting Provisions	Consult with local fire safety authorities – this is an area where professional advice in consultation with appointed authorities are needed to determine requirements in respect of the following: – Fire hydrants – Fire Hose Reels – Fire Extinguishers – Fire Blankets	
Flagpoles	Provide at least one in a prominent area for ceremonial occasions	
Flammable and Corrosive Materials Storage	To be provided in Secondary Schools in Art, Technical Studies and Science Chemicals areas:	
	Art and Technical Studies	Metal Trafalgar (or similar) flammable liquids cupboard vented to the outside. One in each area – 120 or 240 litre capacity
	Science Chemicals Store	Metal cupboard as above – in a store room mechanically ventilated.
Floor Coverings	Generally teaching areas and offices to be carpeted 80/20 wool carpet commercial quality. Wet areas and practical activity areas to have vinyl. Toilets to have ceramic tiles or welded sheet vinyl. Vinyl and ceramic floors to be non-slip surface.	

Fly Screens	Fly screens to be provided to windows and doors of areas where food is prepared – Canteens and Food Technology areas. They may also be required to other windows in locations where flies are likely to be a problem.
Foot Scrapers	Provide in areas where soils are likely to adhere to shoes. See also **Door Mats**
Furniture Provisions	Loose furniture allowance to be included in project budget.
Grounds	Allow for passive and active, structured and unstructured recreation. Play equipment to be carefully evaluated in context of safety and school uses. Paving in heavy wear areas and near buildings, particularly entrances. Shade for taking meals and for shelter generally Weather shelters – can double as assembly areas Consider maintenance and drainage in planning
Gymnasium and Multi-purpose Hall	Plan the school in the commencement phase so that multiple use can be made of teaching spaces for example with transportable walls. Assume that the facility of a gymnasium and/or multi-purpose hall will be part of a later stage. Evaluate the use of space and design the facility so that as many different functions as possible can be conducted within the facility. Additional expenditure to achieve this may save many times that by duplicating space for other purposes if the original facility is not fully utilised.
Hand Driers	Electric hand driers for both students and staff can reduce costs of supply of paper and disposal costs. Provide only those with metal casing and automatic start/stop operation and fixed nozzles.
Handrails/Balustrades	To be Australian Standard - preferred height 1200mm.
Historic Buildings	Liaise with relevant authority in community - the local government body will have details of relevant authority and some details of particular buildings affected.

Heating, Cooling, Ventilation

Mechanical systems including air-conditioning should be introduced where necessary to alleviate extremes of temperature, not to provide stable internal conditions except where this is necessary.

Evaporative cooling is appropriate only where there is generally high temperatures and low humidity.

Heating should not be non-flued gas heating.

Natural ventilation to be provided to all occupied spaces except where it is appropriate to rely at all times on air-conditioning.

Ensure that all such systems comply with Australian Standards.

Hot Water

Provide hot water in the following areas: (minimum requirements)

Primary Schools

Basins in Staff toilets, in sick bays, toilet for disabled persons, all showers, Canteen basin and sinks and one outlet in practical activities area, staff lounge.

Secondary Schools

Basins in Staff toilets, in sick bays, toilet for disabled persons, all showers, Canteen basin and sinks, Home Science sinks and basins, photographics sinks, Art (one outlet to each room), Science areas (one outlet to each room), Technical Studies wash basin, staff lounge.

Set thermostat at 60-65°C in accordance with AS 1308.

Industrial Safety

Check with local state government authority as to application, if any of Industrial Safety regulations in workshops for both students and maintenance staff.

Key Cabinet

Instal a key cabinet in secure area, preferably the Secure Store in Administration area where at least 2 copies of all keys are retained, one to remain at all times in the key cabinet for making copies when required. All keys to be marked and a register of issue of all keys kept with the key cabinet.

Kilns

Allow for inclusion, if not initially, then at some subsequent time. Provide for gas and/or electrical connection.

Consider appropriate fume/heat exhaust.

Lighting

Fluorescent lighting (tubes or globes) preferred for all internal lighting except where feature lighting may be required for special effect.

All lamps should not be higher than 2.6m above the floor to facilitate changing of lamps. In cases where lamps are required above this level special equipment is required for access.

Mats

Provide for removable mats on the inside of external doorways - inset into carpeted areas and loose laid on vinyl areas (preferably with non-slip backing).

Mirrors

Provide for individual mirrors above hand basins in staff and student toilets. Polished stainless steel can be an advantage.

Outdoor seating

Provide fixed seating as part of the siteworks - can be integrated with raised garden beds, retaining walls shade structures and the like. Provide sufficient for students to be seated at meal breaks and for outdoor teaching areas.

Primary school seat height	325 - 450mm
Secondary school seat height	325 to 600mm

Photography sinks

In secondary school photography areas to be of stainless steel (816 grade acid resistant)

Pigeon Holes - Staff

Locate near staff lounge and printery. If possible design in such a way that pigeon holes form the wall between the staff area and administration areas for easy dispersal of literature.

Allow for one space per staff member plus 10% - calculate on maximum forecast school enrolment.

Minimum size 330 x 270 x 130mm. To hold A4 sheets and folders flat - check stationery in use.

Pinboards

Allow for at least 2 pinboards per teaching space and one in each office.

Primary	from 300mm above floor to 2100mm except where there are fixed benches
Secondary	from 1200mm above floor to 2100mm or above benches

No pinboards above sinks

Ensure pinboards do not clash with GPO's, light switches and other fittings.

Use only high quality pinboard material - cheap alternatives which do not endure are in the long run more expensive.

Playground equipment

Allow for quality equipment - fixed equipment is preferred to avoid swinging elements which can cause injury.

Rainwater tanks

Provide only in country areas where water is of poor quality or in short supply. Ensure that vermin are kept out of tanks and appropriate roof cleaning is done to ensure maximum purity of water stored. Instal filters and foul water separators in critical areas.

Safe	Instal a floor safe in administration area, preferably in Secure Store.
Safety Issues	The following issues need to be considered to ensure the safety of school users: - Fire safety provisions of the Building Code of Australia. - Compliance with the requirements of relevant fire safety department - Wide aisle ways, passage ways and clear exits - non-slip surfaces on stairs, ramps and floor tiles in toilets - exit and security lights and emergency lights properly maintained - avoid awning and casement windows which open at head height into walkways - door handles to be automatic return lever handles - separate vehicle and pedestrian traffic with bollards, fences and planting - avoid window air-conditioning units projecting into walkways - avoid sharp corners on joinery units - provide protective enclosures to hot water units if accessible to staff and students.
Sanitary Disposal systems	Allow space for disposal facilities either by incinerators or serviced disposal units - one to each female toilet.
Seating	Refer Outdoor Seating
Secure Rooms	Allow for a secure storage rom for teaching areas, Library Resource areas and Administration areas. Characteristics of such spaces should approximate: - internal location, avoid external walls, no windows - concrete slab floor - solid masonry walls, preferably cavity walls - welded steel mesh over suspended ceilings - steel door frames bolted to walls - solid core doors with steel lining - multi-lock or Chubb lock, security hinge bolts.
Security alarms	Security alarms of the silent, monitored kind incorporating intrusion and movement detectors, preferred. The whole school should be alarmed. Ensure detectors cover all likely points of entry and movement in the building.

Each building or zone should have cypher keypad to allow de-activation of areas for after hours use.

Provide combined smoke and intruder alarm detection alarms in new schools.

Security gates

Metal gates and fences should be provided to secure internal courtyards, full height with no horizontal rails for climbing. Fit special purpose metal encased slide bolts with measures to overcome use of bolt cutters.

Security lighting

Vandal resistant light fittings to porches, alcoves and verandahs, covered ways and building corners.

Have them automatically switched by photo-electric solar switches and/or movement detectors.

Lights mounted high on walls give best security lighting.

Security on Windows

Security grilles should be provided on all canteen windows and doors. Also to computer and music room ground floor windows.

Showers

Provide at least one shower associated with staff toilet facility.

In secondary schools consider whether showers are required for sporting activities.

Sick rooms

Design door openings and passage outside them suitable for manoeuvring of stretchers.

Provide a hand basin with hot water and a toilet adjacent.

In Primary schools sick rooms are to be near the General Office to allow supervision by clerical staff.

Provide for a bed, elevated with cupboards under, bench and sink with cupboards for storage of all first-aid equipment and material.

Signage

Suggestions for inclusion in signage list:

- School name on main road frontage
- visitor car-parking entry and service vehicle access
- signs to direct to Administration and any community use facilities
- standard regulatory and safety signs (use these as teaching aids)
- male, female and wheelchair access toilets
- internal room signage as appropriate
- number every room and space for managing the key register, the maintenance programs and giving general directions to people.

Spiral Stair cases

Not permitted under safety requirements of BCA and in some states under other regulations. In any case they are not generally regarded as safe in public buildings.

Stoves

Provide a stove for cooking as follows:

Primary schools	Staff lounge kitchenette
	Practical activity areas
Secondary school	Staff lounge kitchenette
	Home economics areas
	Consider needs of disabled persons

Single stoves to be vented to outside with range hoods if possible. In home economics area provide for roof/ceiling exhaust ventilation.

Taps and sinks

Primary Schools (required)	In art craft areas
Secondary areas (required)	In art-craft areas
	Science areas
	Photography areas
	Technical studies areas
	Home Economics/Food Technology
	Design studio

Allow staff to have input into kinds and location for the functions to be conducted in the various spaces.

Consider types of sinks appropriate to requirements.

consider water needs for other areas (serviced classrooms, Human Society and Environment etc.)

Telephones

Provide for central point for Main Distribution Frame (MDF) and for Secondary distribution frames as appropriate. Allow space for PABX system in a secure well ventilated space.

In initial installation provide wiring for future installation of telephones.

Take account of future needs for fibre-optic cabling as well as for data cabling.

Toilets

Refer to BCA as well as to educational and local health authorities for specific requirements including number required, including basins, wash points and drinking fountains.

Ventilation of printeries	Where photocopying is done mechanical ventilation is required to dilute ozone emissions. Locate photocopier near exhaust fan. Where offset printing is done mechanical exhaust systems designed by engineers are preferred.
Waste disposal	Discuss with local health authorities - allow for enclosure, washing of receptacles, truck access, sorting of refuse for recycling.
Water supply	Check availability and adequacy of water supply especially water pressure for irrigation of playing fields and for fire main requirements.

Acknowledgement:

This information has been prepared with much appreciated assistance from

Andrew Tidswell
Supervising Architect - Education
South Australian Department for Building Management

9.15. Construction Consultants

This is a list of the various kinds of consultants that might be used by schools in the development of a building and site development project.

List of practitioners can usually be found by contacting the local professional organisation or association.

Consultant	**Role Description**
Architects	Assist in development of client brief, documenting of building and site components of master plan, designing and planning buildings, site layout, preparation of contract documents including drawings and specifications, and usually oversight and coordination of the team of design and documentation consultant team. In addition - oversight of the construction phase of the project - managing the contract on behalf of the client (school).
Consulting Engineers	Consulting engineers are many and varied in the expertise they offer. Some firms are multi-disciplinary. They may offer design only but usually the documentation for contract purposes as well as part of the overall documentation team. Not all these kinds of engineers are required on every project.
Civil	Design of major earthworks, roads and major site constructions such as bridges, dams, stormwater detention systems.
Geotechnical	Analysis of the foundation material for buildings and site structures and preparing reports for use by the structural and civil engineering consultants.
Structural	Design of the structure of a building, its floors, walls, columns, retaining walls, roof structures. Assessment of structural stability of existing buildings is another aspect of their work.
Electrical	Design of the electrical systems of the building and site including the main power supply. Forecasting the anticipated electrical loads for design of local power grid.
Mechanical	Design of the air handling systems, both ventilation (exhaust and supply) and air-conditioning. Design of lifts and hoists and other materials handling systems.
Hydraulic	Design of roof, site and sewage drainage systems, cold and hot water supply systems, fire suppression such as hose reels and hydrants and sprinkler systems (rarely required in schools). Water heating devices including solar water heaters.
Acoustic	Analysis of acoustic environment both noise from community into the site and its impact on the internal environment as well as "room acoustics" - the anticipate performance of spaces where acoustics is critical e.g. halls and music rooms. In most cases the performance of classrooms is well within the design capacity of the architect who receive training in this area of design.
Land Surveyors	Analysis of site conditions as well as documenting existing landforms to assist the designers in their work. They provide information on the title of the land and assist where sub-division may be required. With modern equipment computer the information from an analysis of site can be supplied in computer format direct to other consultants for integration with design processes where computer aided design is being used.

Quantity Surveyors	Analysis of cost and amount of materials and labour to be used in the project. The involvement from the beginning assists greatly in forecasting costs. Their major input is seen in the preparation of a document called Bills of Quantities, but their most significant contribution is in the area of cost management.
Interior Designers	Appropriately qualified interior designers can assist greatly in forecasting impact of choice of materials on the interior environment and its use over time. Their training is in the area of colour, human reaction and response to various materials, light quality and durability. Their contribution is most often incorporated in the architects documents although they may be employed separately to prepare colour schedules and fabric selection including floor materials.
Town Planners	Their training is in the area of town planning laws and zoning, understanding and applying principles of micro-geography and negotiating with local and regional planners. They are not usually employed in the detail design of schools but may assist in projects where there is an intention to coordinate a community centre with a school in shared use of facilities.

9.16. Financial Consultants

As has been indicated throughout this document the Master Planning process should be attempted only after the school authority has put in place a comprehensive Financial and Educational Plan. It is anticipated that the school staff will have access to the necessary expertise in order to deal with the latter.

The following are firms with whom contact was made in the course of preparing this document. They are examples of those who are providing Financial Planning advice to schools.

Pizzey Noble Pty Ltd
Level 2, 19 Cato Street
Hawthorne East, Vic 3123
Phone (03) 9822 8033 Facsimile (03) 9822 8539

Pizzey Noble is a company which provides management and consultancy services in response to client needs. Expertise in project management, master planning, strategic and financial evaluation to educational institutions is one of their specialties. Pizzey Noble operates nationally. Contact Mr Allan Pizzey

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Educational Finance Services Pty Ltd
5 Pannikin Street
Rochedale South Qld 4123
Phone (07) 3841 2847 Facsimile (07) 3841 2304

Educational Finance Services has provided a consulting service to independent schools and colleges since 1989. The company acts as consultants to more than 90 schools throughout Australia. The company provides specialised education and financial services to schools in strategic planning and management including capital grant submissions, ERI analysis and all government related matters. Contact Mr Peter Hollett

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Grant Thornton Consulting
Level 15, 1 Market St
Sydney 2000
Phone (02) 284 6666 Facsimile (02) 267 4000

Grant Thornton is a national and international accountancy firm providing a comprehensive range of business advisory services to a wide variety of clients. Their client base includes a number of educational institutions. They aim to help their clients' businesses grow through better business and planning practices.
Contact Mr Mark Taylor

9.17. Contributing Consultants

The following list is provided as a resource for schools based on information supplied by various consultants who have contributed information for incorporation in the Guide Document.

Bruce Allen and John Courmadias Pty Ltd, Architects
27 Niagara Lane, Melbourne 3000

Toni Appleton, Architectural Design
Mafeking Road, Goonagerry via Lismore NSW 2480

Paul Archibald Pty Ltd, Architects
2a Miln Rd, Box Hill North Vic 3129

Andrew Blamey Architects
2b Azalea Grove, Pennant Hills 2120

Brown, Falconer Group Pty Ltd, Architects
255 Magill Road, Norwood SA 5069

Burling Brown and Partners Pty Ltd, Architects
PO Box 930, Southport Qld 4215

John Carr and Associates, Architects
198 Marius Street, Tamworth NSW 2340

Forward, Viney, Woollan, Architects
33 Little Bourke St, Melbourne Vic 3000

Clarke, Hopkins and Clarke, Architects
2a Bridge Road, Richmond, Vic 3121

Peter G Lyall and Associates Pty Ltd, Architects
1/1057 Burwood Highway, Ferntree Gully Vic 3156

Geoff Nairn Architects
44 Tynte St, North Adelaide, SA 5006

Noel Bell Ridley Smith and Partners Pty Ltd, Architects
2 McManus St, McMahons Point NSW 2060

Don Roderick - Architect
8 Hanna St, Mt Ommaney Qld 4074

Stanton Dahl, Architects
18 Oxford St, Epping NSW 2121

A K W Architects Pty Ltd, Architects
Suite 56, 2 O'Connell St, Parramatta NSW 2150

Norwich Project Management Group,
Project Management and Planning Consultants
14a Mansfield Road, Galston NSW 2159

Gerald Hanscamp BArch Architect
1588 Burwood Highway, Belgrave Vic 3160

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